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INDEX TO VOL. XVIII.

JANUARY 1 to DECEMBER 15, 1915.

INDEX OF AUTHORS.

GENERAL INDEX.

B

C

LIST OF PLATES.

INDEX OF SELECTIONS FROM COLONIAL MEDICAL REPORTS.*

GENERAL INDEX.

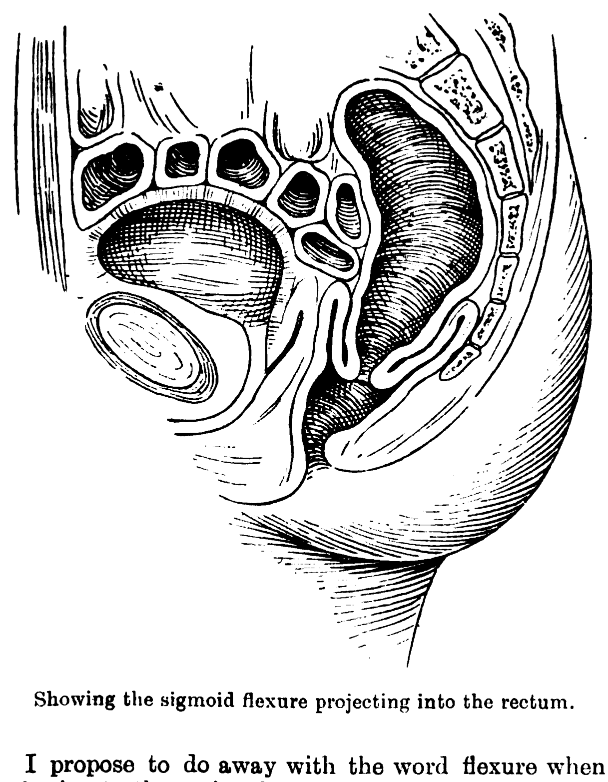
* *Note to Binder.*—These are to be bound to follow the last number in the volume of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

Original Communications.

THE SIGMOID FLEXURE IN HEALTH AND DISEASE.

By James Cantlie, M.B., F.R.C.S.

The elevation of the sigmoid flexure to a position of clinical significance in modern medicine is a fact of great importance. Curiously enough this followed upon an acute attack upon the individuality of this organ by the anatomists who abolished the very name of this region of the bowel and broke it up into two portions—namely, the iliac colon and the pelvic colon. Its large neighbours divided the spoil and the sigmoid flexure was supposed to be blotted out of existence. This anatomical venture is not consistent with either the physiological or the pathological records of the sigmoid flexure, and, whatever anatomists may do in the future, the point is that the sigmoid flexure as a whole has reasserted its position and refuses to be obliterated from the anatomical map.



Showing the sigmoid flexure projecting into the rectum.

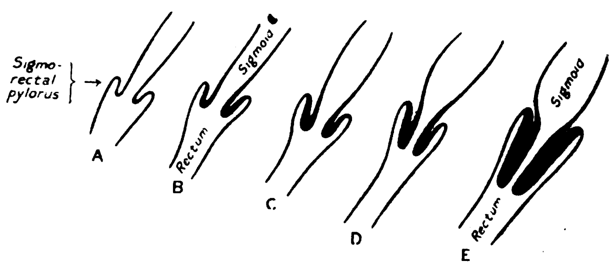
I propose to do away with the word flexure when referring to the region known as the sigmoid flexure; it may be said this was done when the terms iliac colon and pelvic colon were introduced, but, as suggested above, this destroys the entity of what was once termed the sigmoid flexure altogether, and is a step in the wrong direction.

Viewing the sigmoid flexure as an organ with a definite anatomy and function, and not as a mere bend or flexure of the colon, and thus distinct from the hepatic and splenic flexures, the omission of the word flexure would seem justified; in future, therefore, the flexure of the bowel in the left iliac fossa will be referred to as "the sigmoid."

That, however, the sigmoid flexure is rather of the nature of an organ than of a mere channel would seem apparent to those who would study its physiological functions, and its pathological status would seem incontestable.

Applied Anatomy.—Normally the sigmoid can, as a rule, be felt above and rather close to Poupart's ligament in the left iliac fossa. When full of fæces it can be readily recognized; but when empty it can be made out usually by the fingers as they are rolled over the skin in this region and pressed fairly deeply. In shape it is rounded; in consistence it is firm, sometimes rope-like; in size it varies between the dimensions of the middle finger and a cedar pencil; at times it cannot be made out at all. The variation to palpation depends upon the state of contraction; when relaxed it cannot be definitely felt at all; when moderately contracted it feels like a finger beneath the tissues of the abdominal wall; and again, when rigidly contracted, like a cedar pencil.

In health, exploration of the left iliac fossa by palpation elicits a sensation peculiar to this region; the sigmoid flexure when it can be felt causes the patient to complain a little, and when asked if it is painful the answer is, "No, it isn't *painful*, but I can *feel* it." The more rigidly contracted the bowel is



Stages of invagination: A, normal; B, commencing congestion; C, D, increasing swelling; E, a large pyriform mass.

the more marked is this "feeling"; on the other hand, when the sigmoid is relaxed and not therefore to be felt no special sensation is elicited by pressure over it.

The accompanying diagrams show the definite commencement and ending of the sigmoid. Not only is the bowel at this point narrower, markedly narrower, but its whole texture and appearance differ from all other parts of the intestine. When laid open it is seen that the mucous and submucous coats are less loose than elsewhere; that these tissues are less easily stripped from the surface of the deeper coats than is the case higher up and lower down in the bowel; that the entrance and exit to the sigmoid are as distinct as the entrance and exit apertures of the small intestine, namely at the stomach above and the cæcum below; and later it will be shown how these are physiologically distinctive and specialized to a degree. To such an extent is this the case that I

have baptized these apertures the colo-sigmoid and sigmo-rectal and raised them to the same significance as *the* pylorus at the gastro-duodenal gateway. The word pylorus derived from πυλή = gate and αούρος = guard, is applicable at the sigmoid apertures, but especially at the sigmo-rectal, where the function attributable to this junction is most marked. Again, the anatomical feature of the sigmo-rectal pylorus arrests attention. There is not only a distinctive "ring" here, but there is normally an intussusception or a prolapse of the sigmoid into the rectum at this point. In previous writings I have drawn attention to the point, and it is so important that I do not hesitate to repeat the fact. Moreover, others have dealt with the same point, and especially have American anatomists and physicians mentioned and given drawings of this unique feature of intestinal anatomy. The drawing I append is confirmed by other observers. Here it will be seen that the lower end of the sigmoid protrudes into the upper end of the wide rectum. This is an anatomical, not a pathological fact, and is well known to anyone familiar with the appearance of the junction of the sigmoid and rectum when viewed through the sigmoidoscope in a healthy bowel and seen to be aggravated in many pathological lesions of the lower end of the great gut. When the sigmoidoscope is used and the junction of the sigmoid and rectum reached the inflation necessary to further the passage of the end of the instrument from the rectum into the sigmoid shows that the whole bowel at this point is dis-invaginated or dis-intussuscepted, and only when thus blown up does the aperture or gateway into the sigmoid become apparent and patent. It is not that the walls are merely blown apart, as in the rectum, but the bowel at the sigmo-rectal pylorus is pushed upwards, in fact the intussusception is overcome and obliterated. This is possible in the normal or physiological state, but in the pathological state when advanced the parts all too often remain rigid and cannot be blown out of the way when the sigmoidoscope is introduced and air inflated. The effect of this anatomical condition upon the pathological state has a distinct bearing, and accounts for the important part played by the sigmo-rectal pylorus in disease, as regards onset, continuance, and the perversities of function which obtain as regards the secretions, the distension and the general sequelæ. At the upper end, where the colon joins the sigmoid, the inlet will be seen to be wider than the exit at the rectum. This is in keeping with all other regions of the alimentary canal. The pharynx narrows to the gullet, the duodenum with diminished calibre to the ileum, where it joins the colon, and the head or commencement of the colon lessens in size until the lower end of the descending colon is reached. But although the smallest part of the colon joins the upper end of the sigmoid, the change in diameter as well as in structure is so marked that it seems unreasonable, not to say unscientific, to reckon the upper end of the sigmoid as part and parcel of the descending colon, as the name iliac colon implies. The lower end of the sigmoid where it joins the rectum terminates even more markedly abruptly than does the inlet. This is the narrowest part of the intestine below the ileo-cæcal valve, namely, at a point 8 in. at least above the anus.

THE FUNCTION OF THE SIGMO-RECTAL PYLORUS.

When introducing the sigmoidoscope, the patient, after the anus is passed, complains but little until the tube reaches the junction of the rectum and sigmoid. Here the patient remonstrates, saying, "Stop, I cannot stand more." When asked why, the reply invariably is, "I'm afraid I am going to have a stool." When the instrument is pushed onwards through the sigmo-rectal pylorus this dread disappears. Again, when after a colotomy above the left groin the sigmoidoscope is introduced in the fistulous opening and pushed away down the sigmoid flexure from its upper end where it has been opened to the lower end, the moment it touches the sigmo-rectal pylorus the patient immediately complains of the desire to stool. Therefore, when this point is touched from below by way of anus and rectum, or from above by way of a fæcal fistular opening in the upper end of the sigmoid, the physiological evidence is the same, namely, that this point in the bowel is the dial for recognizing the necessity for defecation.

The passage of fæces from the sigmoid flexure into the rectum is registered and the individual is informed that the bowel demands to be empty. Were this dial situated at the anus instead of 8 in. up, at the sigmo-rectal pylorus, the desire to defecate would necessitate an immediate rush to stool, a condition of things which would be inconvenient, to say the least of it. The object of having the organ at which the necessity to go to stool is registered at some distance above the anus is apparent, for in the upper part of the rectum, which for the first 4 in. of its extent is capable of wide distension, the fæces can be held until it is convenient to get rid of them.

Passing now from the more anatomical and physiological aspects to the clinical and pathological conditions, the importance of the sigmoid flexure is equally and perhaps even more markedly apparent.

When examining the abdomen, especially in the case of a tropical resident, who may have had one or both of the two commonest ailments—namely, malaria and dysentery—all four corners of the abdomen have to be inspected, viz., the hepatic, the splenic, the cæcal and the sigmoid; of these the last named is in all cases of intestinal flux the most important.

To examine the left iliac fossa and determine the condition of the sigmoid, stand on the right side of the patient opposite the loin, lay fingers of both hands about 1 in. above Poupart's ligament, press the pulps of the fingers gently but firmly, at the same time rolling the fingers slowly up and down, when the sigmoid may be felt rolling below the fingers. The pain may, however, be too sharp to allow of the outline being traced exactly; with a little modification in pressure and continuance of the movement the pain subsides and the bowel can be felt. If there is much amiss the sigmoid will be firmly contracted and may feel no bigger than a cedar pencil; on the other hand

it may feel as thick as a thumb. The most tender point to be made out is usually towards the pelvic brim where the sigmoid leaves the iliac and reaches the pelvic region. The tenderness elicited by this examination will suggest the necessity for rectal examination, and this when possible should be carried out without delay.

To Examine the Sigmoid by the Sigmoidoscope.

The proctoscope, a simple stem and cannula some 8 in. in length, was a useful addition to our means of exploring the rectum and the sigmo-rectal pylorus. The illumination of the part was carried out by a reflecting head mirror. The proctoscope, however, has been largely supplanted by the sigmoidoscope, a tube about 10 in. in length, along which an electric illumination can be passed right up to the end of the cannula, the channel closed by an eye-piece so that air can be pumped in by an india-rubber bag and tube communicating with the cannula. With the distension of the rectum by the air introduced the passage of the sigmoidoscope is rendered much safer than when one has to blindly trust to the proctoscope. The introduction of this instrument is without danger if ordinary precautions are taken. In the first place, it is well to avoid the use of a general anæsthetic when proposing to use it. For one reason it is alarming to the patient, and in the next place there is less likelihood of doing damage to the bowel, as one has the feelings and sensations of the patient to guide one as regards pain during the passage. It is well, also, not to insist on placing the patient in fantastic positions, otherwise a second examination will be refused. Some clinicians in their "thoroughness" place the patient in the prone position with the table sloped so that the body is at an angle of 45° while the head is near the floor and the buttocks are the highest part of the body. This is a proceeding which may be undergone once but is not likely to be allowed a second time; and as we shall see it may be necessary for examination and for applications to see the diseased spot in the bowel several times, the refusal cuts short all other attempts at local treatment.

It is sufficient to lay the patient on the left side with the knees drawn up, and the legs placed at a right angle with the thighs so as to get the feet out of the way of the examiner's head when inspecting the bowel. The instrument, sterilized before use, should be warmed by dipping in hot water or heated over a flame. If dipped in water the rod (trocar) should be removed and a piece of cotton wool forced along the cannula to dry it, as the act of placing the instrument in water leaves some drops within the tube, thus impeding and confusing the view.

Apply vaseline or other lubricant to the anus, and over the blunt nozzle of the instrument. Press the instrument gently with gradually increasing force into the anus in a direction forwards in the axis of a line drawn from the umbilicus to the anus; continue pushing in this direction for 1½ in. to 2 in., then changing direction bring the instrument forwards so that the nozzle is directed backwards into the hollow of the sacrum. Push gently in this direction for 2 in. to 3 in. as gauged by measurements found on the cannula, then gradually bring the instrument backwards so that the blunt nozzle is made to travel upwards to the upper part of the sacrum. After the distance of 6 in. to 7 in. is traversed the patient usually calls out "Stop," and when asked why, he replies, "Because I am going to have a stool." This fact was referred to above, and it tells the doctor that he has reached the mouth of the sigmoid where it joins the rectum. I use the word "mouth" advisedly, for in the usual pathological states met with, the sigmoid projects into the rectum, as does the os uteri into the vagina, and the term "os sigmoidea" would not be out of place.

Here a careful examination should be made before pushing the instrument further. If there is much ulceration and rigidity it is inadvisable to attempt to force the passage, as the tender surface would be damaged, or the bowel might be ruptured. If, however, inflation shows that the sigmoid is patent and distensible, the instrument may be pushed further on along the lumen of the sigmoid. After passing the lower inch of the sigmoid the patient seldom complains until its upper part is reached. It is, however, advisable to get far enough in to view the lower end of the descending colon.

The passage of the sigmoidoscope does a double good in chronic cases; it allows a thorough inspection of the bowel, and it further distends the sigmo-rectal pylorus, which being the seat of trouble as a rule in chronic affections is also the site of commencing stricture, and just as the passage of a catheter along a strictured urethra favours cure, so does the passage of the sigmoidoscope serve as a means of distending the strictured bowel and thereby favouring cure.

The use of the sigmoidoscope benefits therefore, (1) by locating the seat of disease; (2) allowing of direct application being made to the ulcers and diseased surface generally; and (3) by distending the bowel, which at the seat of trouble is always more or less strictured.

The Lesions in the Sigmoid.

Amongst the multiplicity of names with which we are at present made familiar in regard to intestinal lesions, one is apt to lose the salient point for investigation and treatment. In acute disease the seat of trouble may, and does usually, include the whole length of the colon from cæcum to anus; be the ailment classified as amœbic dysentery, bacterial dysentery, malignant dysentery, acute colitis, or any of the many rather fantastic names adopted. In malignant dysentery the affection of the bowel may extend beyond the cæcum and ileo-cæcal valve, and involve the lower 2 ft. or 3 ft. of the small intestine.

Be the name of the disease what it may, be it acute or chronic, the part of the bowel between the ileo-cæcal valve and the anus which is most characteristically, most constantly, and most persistently affected is the junction of the sigmoid with the rectum, the sigmo-rectal pylorus.

Rapidly is this fact gaining recognition, and the sigmoid lesions are now being spoken of and written about in a way which but a few years ago was unknown. The introduction of the sigmoidoscope has brought that about; the question is now no longer one of opinion, for the ulcers, the abrasions, the scars, the strictured condition can be actually seen, and, more important still, they can be actually dealt with as an open wound is dealt with. The treatment becomes as it were a surgical matter, and not one which was wont to be left to the physician to treat by diet and by drugs. As will be seen, neither diet nor drugs play much of a part in the treatment.

In acute ailments or inflammatory conditions of the intestine, be they due to dysentery, or so-called colitis, inspection by the sigmoidoscope is pretty well out of the question; but that the sigmo-rectal pylorus plays an important part in the signs and symptoms is manifested by the presence of tenesmus.

Tenesmus.—This most troublesome symptom I have explained, and my conviction grows with years, as being due to the condition of the sigmo-rectal pylorus. Naturally slightly invaginated into the rectum, the sigmoid in inflammatory states protrudes more and more into the rectum as the intensity and the continuance of the ailment increase. Above, the junction of the sigmoid and rectum has been referred to as: (1) The narrowest part of the large intestine; (2) the most sensitive part of the gut; and (3) as the spot where the sensation of the desire to go to stool is registered and to which it is referred. The anatomical state would naturally lead one to infer that here more than at any part of the large bowel the evidence of trouble would be most marked. Naturally intussuscepted, this is increased; naturally sensitive and endowed with a definite function, these are exaggerated; and the increases in these various directions all tend to explain the phenomenon of tenesmus. The prolapse increasing and the part becoming swollen and thickened, conveys the sensation that something is there to be got rid of. In health, fæces passing the sigmo-rectal pylorus call one to stool, in inflammatory conditions the thickened bowel takes the place of the fæces and the desire to stool continues as the cause, namely, the invaginated and swollen bowel remains, and the endeavour to obey the summons to stool, registered by the dial which notifies the desire to stool, results in continued straining, otherwise termed tenesmus.

Tenesmus is due to a perverted anatomical and functional state, not to a nervous or neurotic condition to which it is so often referred. The explanation of the removal of this sensation by an injection of hot water into the rectum is simply the disinvagination of the intussuscepted portion of the sigmoid with the upper part of the rectum.

The Sigmoid in Chronic Lesions of the Bowel.

Examination of the bowel in acute internal trouble is only occasionally possible by means of the sigmoidoscope, but in chronic affection the examination should always be made.

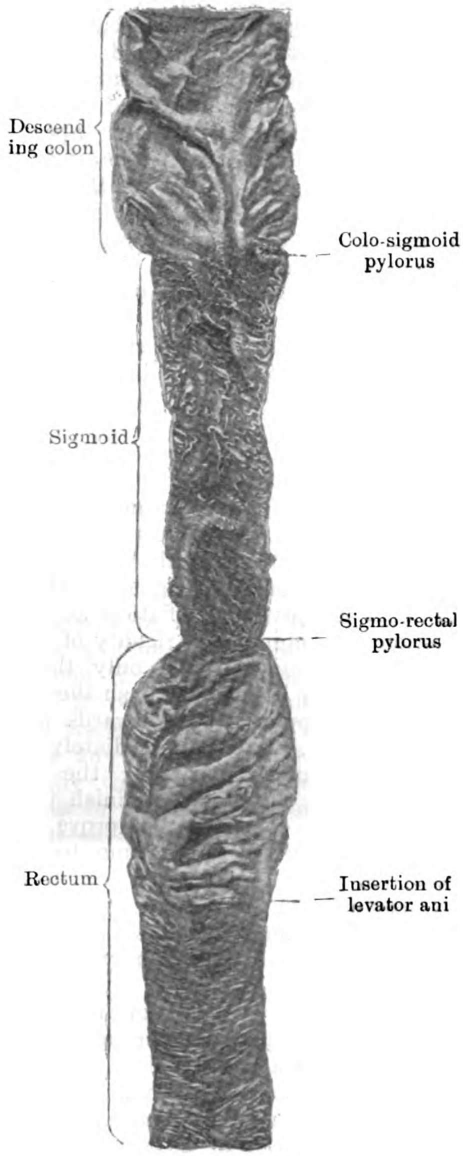
In chronic dysentery, in most dysenteric states, in long-standing mucous colitis and allied troubles the focus of disease will be found at the sigmo-rectal pylorus and 2 in. of the sigmoid above that point. In relapses the sigmoid may be involved throughout its whole length, and even the descending colon at its lower end more especially.

On introducing the sigmoidoscope, if the sigmo-rectal pylorus is ulcerated or in a chronic catarrhal or congested state, the rectal mucous membrane will be found in an œdematous state, the surface is pale and flabby, and the swollen folds obscure the view. No lesion of the surface is usually patent until the upper end of the rectum is approached, when the entrance to the sigmoid comes into view. Here the entrance seems small, rounded and rigid, and according to the stage of the ailment its surface may be granular, velvety, excoriated, abraded, ulcerated, studded with minute bleeding points, or presenting scars where the several solutions of continuity have healed. An attempt to push the sigmoidoscope through this spot causes pain—it may be to such an extent that any further attempt must be given up. It may be said were the patient under an anæsthetic the instrument could be passed into the sigmoid; this is an indiscreet remark, for any more violent attempt than the sensations of the patient will allow would be fraught with injury and perhaps rupture of the bowel. The sensations of the patient are the only guide to the safe usage of the sigmoidoscope and must ever remain so; for the thickness and thinness of the bowel in disease it is impossible to ascertain by any known clinical methods.

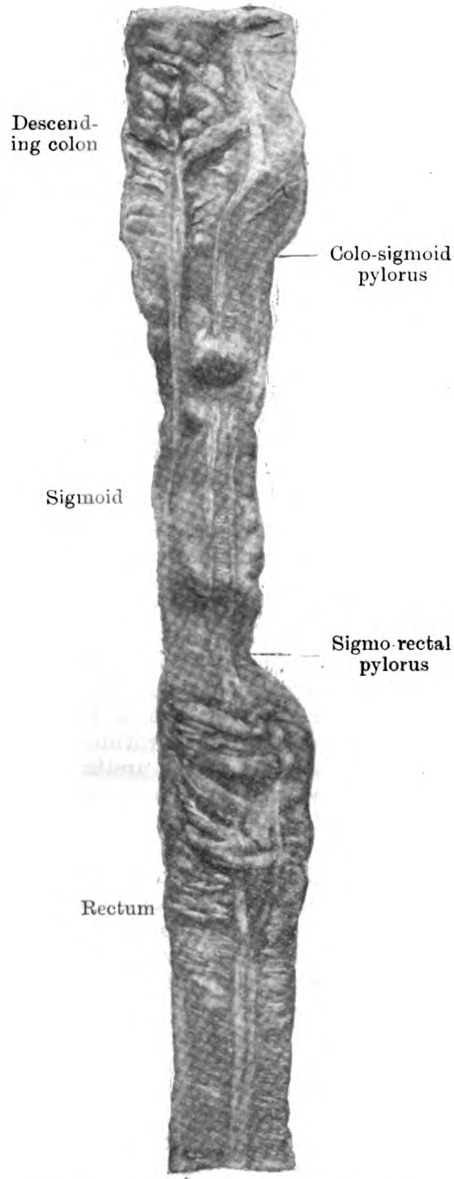
The Future of an Inflamed and Ulcerated Sigmoid.

With treatment (see below) the ulcers may heal, the swollen mucosa may subside, the os-like character of the sigmo-rectal pylorus will disappear, and temporarily at any rate, or it may be permanently, a cure is effected. On the other hand, although the inflammatory conditions subside, a thickening at the lower end of this pylorus may and all too often remains. So long as this is the case relapses will ensue and continue well-nigh indefinitely. The form the relapse takes is a reappearance of mucus only in the stools in milder cases, of blood and mucus in more severe relapses, and of mucus, blood and loose stools with pain, griping, loss of strength and some febrile disturbance in the most severe.

The pathological state is due to a narrowing of the bowel at and immediately above the sigmo-rectal pylorus. The narrowing or strictured condition may be œdematous only or it may result in a congested or inflammatory state of the part followed by a true stricture, which sets up a condition comparable with that met with in stricture of the urethra. In stricture of the urethra affecting the neighbourhood of the membranous portion, the urine does not pass freely and a drop of urine is retained behind the stricture, which in course of time sets up a catarrhal



Inner aspect of bowel.



Outer aspect of bowel, showing the longitudinal muscular fibres approaching each other at the upper and lower apertures of the sigmoid.

state of the urethra, attended by a mucous exudation giving rise to "weeping" at the end of the penis, and the presence of flocculi in the urine.

At times, the catarrhal condition extends backwards into the bladder, when the urine becomes cloudy from mucus or a mild or severe cystitis is set up. This condition with rest and appropriate remedies subsides and the urine becomes normal, to be again from time to time similarly affected. The same condition obtains in the sigmoid when the sigmo-rectal pylorus is narrowed from any cause. There is always mucus in the stool, it may be to an unimportant degree when the congestion is slight, but it may become plentiful by the catarrhal state extending upwards along the upper reaches of the sigmoid, and even to the descending colon itself. In the latter state the mucus is excessive, for compared with the urethral tract the colon is enormous, these tubes standing to each other in their dimensions as a goose quill to a tube of the size of the forearm and the mucus present as a teaspoonful to a tumblerful in quantity.

Mucus in the stools from a true catarrh of the bowel must be distinguished from the mucus shed in casts from the bowel. The latter is due to pressure from without upon the bowel caused by a misplaced uterus, a chronic inflammatory state of the left ovary or in the left side of the pelvic tissues, a tumour pressing on the rectum or sigmoid or even a pregnant uterus. The catarrhal state due to lesions within the bowel itself does not give rise to casts, but to flakes of mucus separately passed or incorporated with the fæces, occasionally blood-tinged.

In the cases of mucus due to pressure in the bowel there may be no diarrhœa, but with the catarrhal state the stools are soft and sometimes watery.

Sigmoidoscopic inspection of the bowel varies also according to the cause of the mucus; when due to the pressure of a tumour, thickening around the bowel, &c., little or no change in the lumen will obtain, but when lesions of the surface of the bowel occasion the discharge of mucus these can be readily seen.

It is this post-dysenteric or chronic condition of bowel trouble which is usually met with in Britain in patients invalided home owing to intestinal trouble. The term chronic colitis is often assigned to the disease and the patients state that they have had dysentery followed by colitis.

Treatment.—There is no more troublesome complaint in the whole category of disease to deal with than this so-called "mucous colitis." Alternating states of constipation and intestinal flux with mucus and occasionally blood obtain. It is not a question of months, but of years, that one has to look forward to before the disease may be wholly eradicated; but the cure may be accelerated if the doctor recognizes that the seat of disease is in the sigmoid, and that it is not a general affection of the bowel but a purely local trouble which can be dealt with by direct application.

My view of the treatment is in keeping with the treatment of a stricture of the urethra; and the bowel trouble becomes as much within the surgeon's sphere as does a stricture of the urethra. Primarily the part must be viewed by the sigmoidoscope, and it is as necessary for the doctor to be familiar with the use of this instrument as he is with the catheter.

The method of introduction of the sigmoidoscope and the conditions it discloses have been referred to above. The introduction of the sigmoidoscope does more, however, than to merely display the lesions accompanying mucous colitis; for as stricture of the urethra is cured by repeated introduction of the catheter or bougie, so is the narrowing and prolapsed sigmo-rectal pylorus stretched and relieved by a succession of introductions of the sigmoidoscope. The instrument serves not only as a speculum but by its introduction it causes the strictured portion to be dilated; it is a combined sigmoidoscope and bougie. Another use of this instrument is that one can obtain a specimen of the mucus or a swab from the intestinal wall for examination by the microscope or for purposes of culture.

In every case, in examining, mucus ova should be searched for; the presence or absence of blood determined; amœbæ, bacteria, fungi, &c., &c., reported upon.

Diet.—In post-dysenteric states or mucous colitis, or any lesion low down in the colon, diet plays an unimportant part. The usual statement by the patient is: "I am very careful in my diet, but it does not seem to make any difference." When this statement as to *care* in diet is inquired into it means absence of beef or mutton in the meals—that is all. "Soup, fish, chicken, game, sweetbreads, a little vegetable, followed by milk puddings, or omelette, is all I take, with cocoa and tea and bread and butter and an egg to breakfast." On the other hand, the patient has cut down the diet to infinitesimal dimensions, and the white face, feeble pulse and listlessness show a state of semi-starvation bordering on a scorbutic state; and yet the patient asserts that this rigid diet makes no difference. The fact is that the patient is quite right, diet makes little or no difference, and the sooner the doctor appreciates this the better. Speaking for myself it took me a long time to appreciate the fact that diet had little effect either on the persistence or the cure of the complaint. The fact is nothing but local treatment can cure the trouble.

Local treatment consists in:—

(1) Examination and dilation by the sigmoidoscope.

(2) Applications to the diseased surface.

(3) Enemata as mechanical and specific medicinal aids to cure.

(4) Castor oil.

(5) Dilation by the sigmoidoscope.

(6) Surgical operations.

Dilation by the sigmoidoscope cannot be done whilst the surface of the bowel is ulcerated, nor should it be attempted unless it is seen that inflation reduces the intussusception of the sigmo-rectal pylorus. When by local applications, inflation and enemata the congestion, thickening and rigidity of the bowel gradually lessen, it is then and only then that a serious attempt is to be made to push the sigmoidoscope through the pylorus and onwards along the lumen of the sigmoid. Almost immediately the benefit of so doing becomes apparent; the mucus is reduced in quantity, the stools diminish in number and their shape and consistency improve. Relapse is certain to occur unless from time to time the sigmoidoscope is passed and local treatment kept up. This is in keeping with stricture elsewhere, as in the case of the urethra, when reintroduction of the bougie is necessary from time to time, it may be in fact for years.

The local treatment, by which is meant applications directly to the diseased part and through the illuminated sigmoidoscope, are many, but I have dispensed with all except pure carbolic acid and occasionally iodine. Touching the ulcerated and inflamed surface by dipping a small piece of cotton wool wrapped round the end of the long holder (which accompanies the sigmoidoscope) in pure carbolic acid and rapidly touching the affected points in the intestine cures in a manner which, to me, is astonishing; it causes no pain at the time nor when the fæces are passed at stool, and when after, say two days, the bowel is examined, the improvement is incontestable. The acid ought to be reapplied once or twice at intervals of two, three or six days. With the cure of the ulcers and reduction of inflammation inflation will have a better chance of reducing the intussusception and thereby allowing of the passage of the sigmoidoscope, without which all efforts at cure will be unavailable.

Enemata.—Injections of water into the bowel will alleviate the condition but they will not cure. In small amounts of a pint they cleanse the part, and when a large quantity is thrown up the bowel, the intussusception which is always present in chronic mucous colitis is reduced. Long-standing prolapse

of the lower end of the sigmoid into the rectum tends to thicken the tissue at the seat of trouble, so much so that a mass develops, which by its weight and the obstruction it produces brings it right down to near the anus and increases the tenesmus. To such an extent may the thickening increase that a pear-shaped mass can be felt by the finger. I have likened it to the uterus in feel, shape and size. To many of my colleagues this was deemed an extravagant statement, but I had the satisfaction, when I called in our foremost authority on tropical ailments to a case of the kind, to hear him jokingly say after examining the man's rectum with his finger "Are you sure of the sex?" so alike was the pear-shaped body felt in the rectum to the uterus.

As a rectal wash-out nothing equals sea-water. When sea-water cannot be had, artificial sea-water should be used. Plain salt and water is not a good substitute for sea-water, it is harsh and apt to provoke untoward symptoms and does not have beneficial after-effects. The sea-water must be collected well out at sea, several miles from the shore, or well away from sewer contamination when in the proximity of a town. It should be filtered, brought to a temperature of 175° F., cooled to 100° F., when it may be injected to the extent of from 1 to 2 pints at a time. The amount of mucus sea water brings away is in excess of that possible by any other known enema, and in a few days usually the mucus in the stools disappears. All enemata in bowel trouble are exhausting and it is sufficient to use the sea-water as follows: Two days running after morning stools, then every second day for a week, and during the third week twice only. It may be continued at intervals of a week or ten days subsequently if required. Of all medicinal enemata the best in my experience is Crookes's collosol argentum. This is not an organic compound. I have tried these, argyrol and so forth—they are not to be compared with the collosol argentum. As a germ destroyer it is superlative and it in many cases acts almost with the precision of a specific. The swarming bacteria in the bowel are the cause of the continuance of mucus in the stools; be the initial cause amœbæ or specific bacilli in the mucus, in the catarrhal bowel fermentation develops, and the removal of the fermentive bacteria by the collosol argentum (Crookes) is the first stage towards cure of the complaint. The amount I use is two teaspoonfuls of the solution to ½ pint water, injected once a day for two days, and then every second day for a week or more. This combined with a previous wash-out with warm sea-water is the most effective means of treatment after a trial of many agents. Castor oil in teaspoonful doses is of great assistance in treatment; it is given at bed-time every night for a week or two; the exact mode of its action is difficult to account for; there is more in it than its purgative action, for that is and can be but slight, but the set-back which occurs when it is left off shows most emphatically its beneficial effect. Surgical operations as accessories to treatment or as last resorts are not encouraging. I have washed out the bowel from the appendix many times, but in no instance was I fortunate enough to find any benefit; this I know is not the experience of others.

I have opened the ascending colon, the descending colon, and the upper part of the sigmoid flexure, and established an artificial anus at these several points; with the exception of the last named (that is the sigmoid operation) I have given up all others. An artificial anus in the left groin allows of more direct treatment to the sigmo-rectal pylorus than any other known means. We can examine the part by the sigmoidoscope introduced from below, and through the opening in the groin the instrument can be passed downward and the part inspected and treated. When there is a marked stricture an instrument can be passed from the groin opening without causing the pain that so frequently interferes with treatment by way of the rectum.

My summary of the treatment of an ulcerated, congested and narrowed sigmoid at its lower end, be the cause what it may, is: (1) Inspection by the sigmoidoscope; (2) treating ulcerative, abraded or excoriated parts, by touching them with pure carbolic acid; (3) washing the bowel out with warm sea-water; (4) injecting collosol argentum (Crookes's, not the organic compounds of silver) into the rectum; (5) giving castor oil in teaspoonful doses daily; (6) passing the sigmoidoscope through the sigmo-rectal pylorus at intervals when the acute and subacute signs of the disease are in abeyance; (7) a liberal diet, one course, however, only at a time.

Relapses.—In post-dysentery states relapses are to be expected for some time, it may be a year or two after so-called "cure." They may occur at intervals of weeks or months, and require attention. They are treated by rest in bed for two days, castor oil, enemata, and diet as directed above for the primary treatment. Emetine has a marked beneficial effect at times, whether amœbæ are found in the fæces or not.

BABESIA OR PIROPLASMA: A REPLY TO CHALMERS AND ARCHIBALD.

By R. T. Leiper, D.Sc., M.B.
London School of Tropical Medicine.

In a recent issue of The Journal of Tropical Medicine and Hygiene attention is called by Chalmers and Archibald* to the occurrence of the term Babesia in botanical literature and the statement is made: "It is obvious that, as Trevisan applied the name Babesia in 1889 to a genus containing certain bacteria, this name cannot be used a few years later to name a genus of the protozoa, and, therefore, the name *Babesia starcovici*, 1893, cannot be retained."

It appears to have escaped the authors' recollection that the first of the International Rules of Zoological Nomenclature stipulates that: (1) Zoological Nomenclature is independent of Botanical.

* Chalmers and Archibald, "Babesia or Piroplasma," *Journal of Tropical Medicine*, November 2, p. 323, 1914.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 1, 1915.

EGYPT AS A POSSIBLE FOCUS FOR THE SPREAD OF DISEASE.

SINCE the earliest times the gathering together of soldiers from various parts of the world in war has been responsible for the spread of disease, and it may be that the diseases thus carried become implanted permanently; more especially is this likely to be the case where latitude and climate are akin to those met with in the original home of the disease.

The reasons for these extensions we are now in a position to understand in some instances, but many remain obscure. We know, for instance, why yellow fever appears in certain regions and not in others, the presence or absence of the insect carrier of the disease being the determining factor. We are aware also, that, given the opportunity and the channel of transmission along which yellow fever is spread, there is almost a certainty of appearance of infection along these pathways, and yellow fever may appear in areas of the world far removed from the seat of its prevalence to-day. Given the climate suitable for the stegomyia to thrive in, and the necessary infection, the disease may presumably develop anywhere in the terrestrial belt possessing these factors.

As with yellow fever, so in several instances can evidence of importance in other diseases be readily brought forward. It was in all probability owing to contact in war that ancient Greece became infected with malaria, and, according to some authorities, the importation of malaria accounted for the rather sudden subsidence of the vigour of the people of ancient Greece and of the disappearance of the dominance of their state.

At the present time we have an assemblage of soldiers from many parts in Egypt. They come from different parts of India, from Australia, New Zealand, and Great Britain; and when we note the cosmopolitan character of the population of Egypt at all times—Copts, Arabs, Negroes, Turks, Greeks, &c.—the assembling of many men from many countries differing in climate, from the distant inhabitants towards either pole to the tropical, sub-tropical, and temperate belts of the world, the development of disease may well be watched by the epidemiologist with great interest, and by the Government authorities of the Empire with not a little anxiety. Of many ailments endemic in Egypt itself, one which figures largely is bilharzia disease. Although so largely associated with Egypt, infection by the *Schistosoma hæmatobium* is known elsewhere in Africa as well as in a belt stretching across Syria and Mesopotamia to Northern India. The proof brought forward by Ruffer that in Egyptian mummies, dating from over 1,000 years before the Christian era, calcified bilharzia eggs were present, shows the long period of infection from which dwellers in Egypt have suffered.

The urinary troubles noticed by the French when they occupied Egypt in the opening years of the last century were due to the same infection, and the hæmaturia induced was proved by Bilharz in 1851 to be caused by the presence of *S. hæmatobium* in the urinary passages.

Unfortunately the life-history of this blood worm is not yet fully known; and the attempt to set up different species of the worm, differentiated mainly by the position of the spine on the egg—lateral or terminal—although supported by evidence well-nigh incontestible, is not yet universally accepted. Be that as it may, the danger of infection to those who reside in Egypt for some time has been proved again and again.

It is further to be lamented that the method of infection is obscure. It is assumed that, as the ova escape by the urine, so it is presumed a watery vehicle is the probable channel by which entrance to the body

is gained. It may be conveyed to the alimentary canal by drinking water, or it may find entrance by the way of the skin or even the anal or urethral orifices. The matter, however, is one of conjecture for the most part, and much remains to be done in this aspect of the question. However obscure the origin of this disease may be, the suffering entailed and the high mortality it causes are but too well known, and the possibility of the troops gathered from different parts of the Empire becoming infected cannot be lightly regarded. How they are to be protected, seeing the mode of infection is undetermined, is another matter; and it behoves the British Government, seeing that so much is at stake, to busy themselves with elucidating the source of infection, for as long as that remains unknown all work in the direction of prophylaxis is purely empirical. It is recommended that all water should be filtered and boiled, that fæces should be disinfected, and polluted water avoided for bathing or washing in. These precautions are no doubt wise, but we are working in the dark, and the expense and annoyance caused by these measures may prove, when we know the life-history of the parasite, quite futile as a means of protection.

If the Government, in this time of expense and preoccupation with the more direct exertion of defeating the enemy, is unable to deal with the matter, it had better be stated at once, so that some public body or private individual sees to it that this question, so dangerous to the welfare of the Empire, is not lost sight of. The early winter months are said to be the period when infection is most rife. Sandwith suggests that, as this period coincides with that of a low Nile, there may be a distinct connection between the two observations, and it behoves us, if anything is to be done, it should be done at once whilst yet the winter is young. Of other ailments which may result from the congregation of so many races in Egypt at present, we must not forget that plague, hydatids, pellagra, kala-azar, relapsing fever, Oriental sore, are all possible and may be introduced into Egypt by troops from other countries, in addition to the more evident epidemic diseases such as cholera, typhus, typhoid, dysentery, &c. It behoves all concerned that the health of the troops in Egypt should be carefully observed, for amongst the cosmopolitan collection of folk at present in Egypt we may have even a worse calamity than war befall us.

Annotations.

Discovery of Bacterium tularense in Wild Rabbits and the Danger of its Transfer to Man.—William B. Wherry, M.D., and B. H. Lamb (*Journ. American Medical Assoc.*, December 5, 1914) found *Bacterium tularense* in a fatal epizootic among wild rabbits, and emphasize the fact that this disease is probably widely distributed among rodents and probably transferred to man more frequently than heretofore recorded. They demonstrated this virus in two severe cases of conjunctivitis accompanied by lymphadenitis, high fever and marked prostration. The first case* of human infection has already been reported by them. This case came under the care of Dr. Derrick T. Vail,† of Cincinnati, who has reported the details of the clinical course of this case. The second case is still under the care of Dr. Robert Sattler, of Cincinnati, and will be reported by him. McCoy and Chapin first described the disease in the California ground squirrel. The rabbits found dead were proved to be infected with *B. tularense.* The subcutaneous tissues showed some injection. There were many small irregular areas of hæmorrhage into the skin covering the posterior aspect of the hind legs and rumps. The cervical glands were congested and firm on section. The spleen was a deep blue-black and about four times the normal size, and speckled all over with minute whitish foci of necrosis. The liver was congested and also showed numerous foci of necrosis. The lungs appeared normal excepting for a few patchy areas of consolidation of a deep brownish-red. The peritoneal cavity was full of a hæmoglobin-tinged serous exudate.

Smears from the spleen stained with anilin (Hoffman's violet) showed numerous irregular, coccoid, encapsulated bodies resembling the involution forms of *B. tularense.*

Guinea-pig inoculated subcutaneously with an emulsion of the spleen of rabbit was chloroformed when dying on the third day thereafter. It showed the typical lesions which have been described by McCoy and Chapin and by them. *B. tularense* was isolated from the spleen of this guinea-pig on a slant of coagulated egg-yolk, while no growth appeared on control slants of plain nutrient agar and rabbit's blood agar. Cases of conjunctivitis or lymphadenitis in man may prove to be cases of this disease when there is a history of having shot or handled rabbits, squirrels, or ground squirrels.

Treatment of Tetanus, especially with Magnesium Sulphate.—W. Weintraud and E. Unger (*Berlin. klin. Wochenschr.*, Berlin, October 19, li, No. 42, pp. 1717 to 1736) say when tetanus is once installed little can be hoped from serum treatment, but we have an important symptomatic aid in magnesium sulphate treatment. Too small a dose does no good, and too large arrests the breathing. The individual susceptibility differs also. In the three cases of recovery at Wiesbaden the patients had all been given magnesium sulphate. After a single injection the rigid muscles relaxed, breathing became deeper and freer, cyanosis and sweating subsided, and the patient sank into refreshing slumber. If he is wakened anew by pains and spasms these can be relieved again by the sulphate. Individual tentative experience must be the guide to dosage. Fifty cases of tetanus have been given this treatment, and the mortality of 35 per cent. is being constantly lowered.

* W. B. Wherry and B. H. Lamb, *Journ. Infec. Dis.*, 1914, xv, 331.

† D. T. Vail, *Ophth. Rec.*, October, 1914.

Kocher lost only one of his six patients, and this one succumbed to sinus thrombosis. The intraspinal technique is scarcely applicable outside of institutional supervision. No one physician can carry it through alone; in one case in his service eight intraspinal injections were given during the week, thus arresting the paroxysms each time as they returned, until finally the tendency was conquered. The general practitioner must content himself with subcutaneous injection. Brilliant results have been attained with it, but even this requires the most devoted supervision, keeping the patient under long, deep, lasting anæsthesia and yet not letting it be so deep that the relaxation paralyses vital functions. The danger of total arrest of the respiration confronts one constantly. The aspect, the tint, are no criteria; the breathing must be watched for the slightest tendency to paralysis of the respiratory muscles.

With intraspinal injection the spinal canal can be washed out when the effect is too intense, but with subcutaneous injection no relief is possible in this way; but the drug can be more or less completely neutralized by the antagonistic action of 5 c.c. of a 5 per cent. solution of calcium chloride, injected intramuscularly, repeated several times at need. Artificial respiration, however, is the main reliance and may suffice alone, especially if preceded by an injection of 1 mg. physostigmin salicylate. If these fail, intratracheal insufflation is within the reach of every one. If there is no oxygen tank available, air can be pumped in with an ordinary bellows. If skilled in intubation technique, tracheotomy can be avoided. The sulphate does not menace the heart directly, but the heart may need camphor from the exhaustion following the spasms. The relief from the sulphate is so great that the patients pay no heed to the local pain of the injection, but this can be reduced by giving a little morphine. A method of treatment which was applied in one case with apparent success is described. Antitetanus serum was injected into the ulnar or radial artery through a ureter catheter, pushed in until the tip reached the arch of the aorta. The serum thus pumped in passed at once to the brain through the carotid arteries and into the spinal cord through the descending aorta. He has often introduced ureter catheters in this way far up into veins and arteries. Heddaeus has recently reported a somewhat similar intra-arterial technique, injecting the antitetanus serum directly into the internal carotid artery. He had applied it in six cases of tetanus with gratifying results.

Prevention of Tetanus in the Army.—Jakobsthal states (*Münch. med. Wochenschr.*, October 13, 1914) that during the present war tetanus has occurred soon after the arrival of the wounded, thus showing a relatively remote infection, due to the treatment of the wounds or the increased amount of exposure to dirt in the earthworks, trenches, &c. In all cases of shredded wounds soiled with dirt which reach Hamburg antitoxin is at once injected. There is, however, an insufficient supply of the latter at present, so that the doses have to be restricted. Ordinarily 20 c.c. suffice for prophylaxis, but if much time has already elapsed the quantities should perhaps be made larger, for there is hardly any likelihood of anaphylaxis. For the wholesale production of the serum a sufficient number of good, healthy horses is indispensable, and all such have been pressed into war service. The Army authorities could supply for this purpose otherwise sound horses with strained tendons. Antitoxin should be available at the field hospitals. Dirt must not be blamed for all the tetanus cases, for the dressing materials may harbour the germs. At present a dried fern preparation from the East Indies (*Bengawar djambi*) is being used for hæmostasis. This has repeatedly been shown to contain tetanus germs.

Examination with Duodenal Tube (G. Holzknecht and Lippman, *Munch. med. Wochenschr.*, No. 39, pp. 1993-2024).—The duodenal tube is shown by X-ray pictures to be passed along the œsophagus by peristalsis, but in the stomach it moves forward more under the action of gravity; muscular movements pass it through the pylorus, and after this it moves forward by gravity. These various factors facilitate the introduction of the tube into the duodenum, the patient changes his position, bends forward, reclines on the right side with the pelvis raised, &c., in turn; by this means the tube can be safely passed into the duodenum in from seventeen to twenty-five minutes.

Etiology and Pathogenesis of Pellagra. — Giulio Alessandrini and Alberto Scala ("Contributo Nuovo alla Etiologia e Pathogenesi della Pellagra," Roma, 4.80 francs) experimented on animals with injections of colloidal and gelatinous silica, aluminium, carbonate of soda, and with different foods. Silica produced chronic intoxication in all the animals, and the waters of the pellagrous zones containing clayey substancés in suspension produce the same intoxication when given to the animals in their food. The effects of this intoxication were obviated by intramuscular or subcutaneous injections of solutions of neutral citrate of soda. The authors conclude that the cause of the muscular atrophy observed in pellagrous patients is chemical and endogenous, and partakes more of a mineral than organic nature. Such muscular atrophy is found in mineral intoxications, such as arsenic, &c.

Sleeping Sickness.—J. L. Todd writes (*Brit. Med. Journ.*, November 7, 1914): The statement of the medical men who have practised their profession for so long in Central Africa impel me to put on record once again the entire agreement of my experience of sleeping sickness with all that your editorial and the Livingstonia Mission maintain. The facts recorded there, and the deductions resulting from those facts, accord completely with the views at which those working in the Liverpool School have arrived as a result of their studies on trypanosomiasis. These views have been amplified, completed, and confirmed abundantly by other workers.

That the measures which accurate knowledge of the disease dictates have not been enforced can only be ascribed to that slowly acting spirit of British administration which demands most complete proof of the necessity of any measure before it is enforced, and never secures the enforcement of any measure until the demand for its enforcement assumes the proportions of a popular outcry. I desire to add my voice to an outcry which may possibly secure reasonable action.

Treatment of Exophthalmic Goitre.—Petren (*Hygiea*, Stockholm, No 18, pp. 1009-1072) discusses the indications for surgical treatment and concludes that the cardiac symptoms are the criterion. None of the other cardinal symptoms are constant. But the almost delirious heart action is a futile waste of energy and a source of permanent injury. The palpitation and the excessive action of the heart lead to a compensating hypertrophy and dilatation, and may finally wear out the heart. As this is the most serious element of the clinical picture he bases on it the decision whether to operate or not. When the heart is already enlarged and does not subside under medical treatment, or the heart symptoms show no marked improvement, an operation should be undertaken. In the majority of cases the disease is mild and subsides more or less completely under medical measures. The patient should be kept systematically in bed. The latest reports on serum treatment, especially with milk from thyroidectomized goats, have not been encouraging, but occasional good results from it.

Gynæcology and Obstetrics in Tropical Africa.—Deppe (*Zentralblatt für Gynäkologie*, October 3, 1914) thinks capable, healthy white women necessary for the welfare of a tropical colony, as on them usually depends the efficiency of measures to protect against infected mosquitoes, contaminated drinking water and improper food and clothing. Sex does not affect the liability to malaria, nor do climatic influences. Pregnancy seems to be carried a little past term, as a rule; labour is short and delivery easy, but an obstetric case requires closer supervision in the Tropics than elsewhere. The fœtal membranes rupture early and the unfavourable conditions in the Tropics are liable to render the nervous system unstable. The physical cause should be sought: this may be the hyperæmia of the abdominal organs which is usual in the Tropics. Regular exercise for both men and women alone keeps the body at par in the Tropics.

Glycerine in Bromidrosis.—T. H. Benians (*Lancet*, December 5, 1914) has treated five cases. Three were of a mild type associated with the warm weather; these were completely relieved whilst the treatment lasted, but relapsed when it was discontinued. The other two cases occurred in boys of 14, and were of a severe type, which had persisted for some months in spite of energetic measures to ensure cleanliness, and despite the continued application of drying and disinfectant powders. Both cases were completely cured in the course of three days by the application of glycerine well spread over the soles and toes before the socks were put on, this being repeated each morning as long as was necessary.

Intravenous Quinine in Malaria. — C. Brodbent (*Indian Medical Gazette*, November, 1914), where blood examination or clinical symptoms or both show a severe infection, gives the quinine intravenously. Illustrative cases are narrated to indicate the required dose of the bi-hydrochloride.

Case 1.—L., boy, aged 12, admitted February 20, 1914, temperature 103·6° F.; on 21st blood reported to contain benign tertian parasites in large numbers. Temperature rose to 106° F., brought down by sponging, 22nd. Temperature 103° F., patient drowsy, quinine, bi-hydrochloride 7 gr. in a pint of saline run on to median basilic vein. Temperature fell from 103·8° to 96·4° F. in eight hours—patient collapsed; on 23rd temperature was normal and blood showed no parasites. The patient remained ten days in hospital, during which time there was no further fever and no reappearance of parasites. No quinine given by mouth either before or after the injection, and the boy remains well up to date.

Case 2.—M. G., hospital nurse, aged 18, admitted February 12, 1914, for irregular fever. Her symptoms were suggestive of enteric. On examination of the blood she was found to have a severe malarial infection, large numbers of both malignant and benign parasites being present. Quinine hydrochloride 5 gr. doses given intramuscularly on three alternate days, as well as quinine 10 gr. t. d. s. by mouth. A fourth injection was also given on the day after the third injection. This treatment, while making the patient deaf, did not apparently affect the number of parasites in the blood nor lower the fever. Quinine bi-hydrochloride 7 gr. in a pint of saline was given intravenously; the temperature fell within twenty-four hours to 97° F., and parasites disappeared from the peripheral blood. The temperature rose again the next day, became continuous in type, and the patient proceeded to complete a very severe attack of enteric. The day after the quinine injection the patient had four severe hæmorrhages from the bowel; hæmorrhage recurred for several days. Convalescence was interrupted by formation of a parotid abscess with a discharge of pus from Stenson's duct on the right side, later another on the left, and then an axillary abscess.

This patient had been inoculated against enteric about two weeks before admission, and was discharged cured on May 15, 1914, three months after admission. This case well illustrates a combined infection, the failure of intramuscular quinine and of quinine by mouth, even though the deafness shows that it was absorbed. The intravenous quinine may have predisposed to the intestinal bleeding, but in no other case of intravenous quinine have there been signs of intestinal irritation.

Case 3.—G., aged 35, admitted for fever on May 8, 1914. Blood examination showed numerous crescents and malignant parasites on May 9. May 10, the

temperature rose to 105·8° F. in the early morning and the patient became delirious; 5 gr. of quinine bi-hydrochloride given in a pint of saline: in seven hours the temperature fell from 105·8° F. to 96·4° F.

Crescents were found in the blood on the evening of the day of injection, also the next day (11th), when the temperature rose to 100° F. in the evening. On the 12th there were no parasites. No further quinine was given, the temperature remained normal and the blood free from parasites till the 16th, when the temperature rose to 101° F. and rings appeared in the blood again; the patient was put on quinine by mouth, 10 gr. t.d.s. In this case I tried to see if a small dose would be effective, but apparently it was too small.

Case 4.—M. L., Mussulman, aged 24, seen in consultation. The patient's temperature 104° F., pulse 130; he was delirious and vomiting. Blood showed numerous malignant parasites. Intravenous quinine at once was refused, and quinine therefore given by mouth and intramuscular injection. The patient died about twenty-four hours after.

By comparison with the above cases this case would have stood a fair chance with intravenous quinine.

In such cases in future he proposes to give three doses of 7 gr. at six days' intervals, and if opportunity occurs to watch the blood of such patients for the consecutive three months.

Gerlier's Disease, or Kubisagari.—S. Fichera (*Riforma Medica*, October 24, 1914) describes this disease, which is limited to two small widely separated regions, one being on the Franco-Swiss frontier and the other in Northern Japan. It attacks man, and animals like horses, cows, cats and chickens which frequent stables. It was first observed in 1884, by Gerlier, in France; in 1894 by Miura and Nakano in Japan. It begins in spring, reaches its maximum in summer, and disappears in autumn. Its symptoms are ptosis, falling forward of the head and neck, dimness of vision, with inclination of the head towards the right shoulder, rigidity of the fingers, ataxia, and curvature of the spinal column. Of these symptoms, the first and principal one is paresis or paralysis; the other two symptoms are accessory, visual disturbances and radiating spinal pain. The paralysis attacks only the voluntary muscles, usually the extensors, and is bilateral. The visual disturbances are diplopia and cloudiness of vision. The causes of the disease are: (1) Occupations requiring the repetition of the same muscular movements over a long period of time, as milking; (2) stooping position with prolonged contraction of the extensors of the neck; (3) watching rapidly moving crowds or objects; (4) hunger or digestive disturbances. The diagnosis is usually easy from the flexion of the head, with ptosis. It is distinguished from Ménière's disease by the absence of tinnitus, and from epilepsy by the intact consciousness. During the year 1914 the cause was discovered by Couchoud and Shionoya (*Revue de Médecine*, vol. xxxvi, No. 5) to be a small Gram negative diplococcus, which is found in the cerebro-spinal fluid of the patients, and which on cultivation on various media produces the symptoms of the disease when injected into cats.

Notes and News.

LLANDRINDOD WELLS.

AMONG the spas where the sufferers from tropical diseases, or the malaise consequent on long residence in unhealthy or tropical climates, can derive great benefit, Llandrindod Wells has long held a prominent place.

Llandrindod Wells is situated in Radnorshire, the most sparsely populated county in England and Wales. The town itself lies on a plateau about 800 ft. above sea-level. Though it is protected on the north and east by the hills rising in one part to a height of 2,000 ft., it is in no sense bound in by higher ground, and the result is that at all seasons of the year the climate is dry and bracing, as the rain-bearing winds part with the greater part of their moisture on the high hills between the town and the sea. It is to this quality of air, coupled with a more than average amount of direct sunshine, that Llandrindod Wells owes much of its popularity. A writer on "Spa Treatment" (Dr. Neville Wood) writes: "Some observers who have noted the temperature at which they usually begin to be conscious of a sense of chill, have found that their 'chill point' is perceptibly lower at Llandrindod. To this peculiarity, as well as to the positive warmth, may be ascribed the fact that the bathing season at this resort lasts in reality, and not merely by courtesy, from May to October."

Golfers have two eighteen-hole courses within ten minutes' walk.

The mineral waters are many and various, but can be divided into three groups: (1) saline, (2) sulphurous, and (3) chalybeate. They are all of low mineralization and are therefore useful in gouty and renal diseases. The two former, besides being taken internally, are used for baths and douches. Practically all modern baths and appliances have been installed, and the bath attendants, masseurs and masseuses are as good as any in the kingdom.

Not only do sufferers from tropical diseases resort with benefit to Llandrindod, but also those who are afflicted with gout in its many forms, fibrositis—including in this rheumatism and neuritis—arthritis, the various toxæmic conditions, and chronic skin diseases. In all conditions where there is imperfect elimination or imperfect oxidation improvement may reasonably be expected at Llandrindod Wells.

ACCLIMATIZATION OF EUROPEANS IN THE TROPICS.

AN interesting experiment is narrated by Mr. J. Macmillan Brown in "The Dutch East" (Kegan, Paul and Co., 1914).

In 1665, eight Dutch soldiers and their wives were left at the Island of Kissa (Kissar), 16 miles to the east of the Island of Timor, about 8° S. latitude, considerably nearer the Equator than the most northern point of Australia. Here descendants of these eight couples, 300 in number, still remain—a sturdy race with no sign of any ill-effects from in-breeding. They still keep their blood pure, with fair European complexions, light hair and blue eyes.

Original Communication.

THE WILD GAME AND HUMAN TRYPANOSOMIASIS; WITH SOME REMARKS ON THE NOMENCLATURE OF CERTAIN PAN-AFRICAN TRYPANOSOMES.

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In view of the discussion which has of late been devoted to the trypanosome group in Africa as the cause of disease in man, and to the pros and cons of the existence of a reservoir among the wild game, I venture to suggest a few considerations on the outcome of my own work in Uganda.

Two trypanosomes pathogenic to man have to be considered: first, the well-known *Trypanosoma gambiense*, insusceptible to the action of human serum, causing a chronic disease in oxen, sheep and goats, and running a relatively chronic course in dogs and the smaller laboratory mammals; secondly, a trypanosome of comparatively recent recognition known as *T. rhodesiense*, susceptible to the action of human serum, causing a more rapid disease in man, and running a much more acute course in laboratory and domestic mammals. Neither of these organisms appears to cause any inconvenience to wild game.

In addition to the human parasites, there exist in the wild game, apparently throughout the length and breadth of Africa, certain polymorphic free-flagellated trypanosomes which, when introduced into domestic or laboratory mammals, cause an acutely fatal disease. These trypanosomes, called by various observers *T. ugandæ*, *T. brucei*, *T. pecaudi* or *T. rhodesiense*, share with the *T. rhodesiense* of undoubted human origin the peculiarity of showing posterior-nuclear forms. They are susceptible to the action of human serum, and with the exception of *T. rhodesiense* are supposed to be non-pathogenic to man.

In investigating the part played by wild game in the spread of the human trypanosomes, the problem in the case of *T. gambiense* is the more concise and simple. In the first place we have an organism which has been known for a considerable time as the cause of a fatal disease in man, which, in the case of Uganda, attained the dimensions of an appalling epidemic.

Speaking of the early days of human trypanosomiasis in Uganda, the Principal Medical Officer. Dr. A. D. P. Hodges, C.M.G., tells me that thousands had died in the remoter parts of the Eastern Province before the disease was properly recognized. *T. gambiense* is thus a trypanosome which, even if it be not strictly speaking primarily a human parasite, is at all events essentially well adapted to man as a natural host. The idea that wild antelope might play a part in the economy of this trypanosome was first suggested by the 1908-1910 Commission of the Royal Society in Uganda. In a paper published in the *British Medical Journal* of February 7, 1914, I endeavoured to substantiate my conviction that the Situtunga antelopes on the uninhabited islands of Lake Victoria Nyanza are indeed acting as a reservoir of *T. gambiense*, and are chiefly, if not entirely, responsible for the continued infectivity of the lake shore *Glossina palpalis* with this trypanosome. Since the publication of that paper, striking confirmation has been obtained of the contention there advanced. Two of the fly-boys who have, during the last three years, worked with Dr. Carpenter on the islands have developed sleeping sickness of the Uganda type, and trypanosomes have been demonstrated in their glands. This surely refutes the argument advanced by the opponents of the reservoir theory, who maintain that the trypanosomes called *T. gambiense* by the Royal Society's Commissioners are in reality antelope parasites and non-pathogenic to man. These fly-boys of Dr. Carpenter have been constantly exposed to the bites of *G. palpalis* during their work on the islands. For eighteen months and thirty-three months respectively they have resided on the lake shore, chiefly on the islands, and have not been exposed to any other *Glossinæ*. They constitute, therefore, what is practically the equivalent of the crucial test, human inoculation; showing conclusively that *T. gambiense* still exists in these island flies five years after the removal of the inhabitants.

Now to look at the other aspect of the question. The total cases of *T. rhodesiense* infection reported from Nyasaland and Rhodesia number about 300. *G. morsitans* is the tsetse of the region, and game abounds. In this game the polymorphic trypanosomes mentioned above, which so closely resemble *T. rhodesiense*, according to all available laboratory tests, are very common. On one side stand Kinghorn and Yorke and the Royal Society's Commission in Nyasaland upholding the view that the organisms are identical; on the other hand, Kleine and his fellow-workers, and others, who maintain that they are different species, and that the game organism is non-pathogenic to man.

Now we find various observers in different parts of Africa describing free-flagellated polymorphic trypanosomes, showing posterior-nuclear forms, in the blood of game or domestic animals. There is *T. pecaudi* from the Sudan; *T. brucei* from Zululand, German East Africa and Portuguese Nyasaland; *T. ugandæ* from Uganda; *T. rhodesiense* from Nyasaland and Rhodesia. In addition to these there has recently been isolated a trypanosome from the *morsitans* country in the Northern Province of Uganda, first described by Dr. J. H. Reford, of the Uganda Medical Service, from the blood of a dog, which belongs to the same category. This last organism I have recently been investigating and found to be plentiful in both fly and game. Miss Robertson had an opportunity of examining this organism and confirms Dr. Reford's original opinion as to its general resemblance to *T. rhodesiense*.

The district from which this trypanosome was obtained is of small extent and very sparsely populated. Sleeping sickness occurred all along the Victoria Nile and the natives were in consequence removed inland: the disease was, however, of the ordinary type and confined to *palpalis* areas. Here and there throughout the *morsitans* belt are scattered villages, and the

natives are constantly being bitten both in their shambas and while walking to and fro. Domestic animals cannot exist in these villages, and from the native description of the disease of which their dogs die it is highly probable that the polymorphic organism, as distinct from *T. congolense* (*pecorum*),* is largely responsible for this mortality. A considerable number of Europeans and Indians are also exposed to these *morsitans*, as the motor road from Masindi Port on the Victoria Nile to Butiabwa on Lake Albert, part of the main Congo route, runs for some twelve miles through the fly country. There has, however, never been any suspicion of the existence of human trypanosomiasis of the *rhodesiense* type originating in this fly belt, though a considerable proportion of the natives living actually in the fly belt have been examined recently by gland palpation.

In the records of the Principal Medical Officer's Office in Uganda, years before the recognition of the posterior-nuclear phenomenon, I find references by Dr. Hodges and Dr. Bagshawe, in Gondokoro and Semiliki Valley respectively, to trypanosomes with well-marked free flagellum, very fatal to domestic animals, and causing local œdemas and keratitis. Again in 1912 I recovered a similar trypanosome from wild game in the *pallidipes* districts around Lake George and Edward; of the three strains of polymorphic trypanosomes obtained, all showed posterior-nuclear forms.

Yet another trypanosome, recovered by Mr. Montgomery, Veterinary Pathologist, British East Africa, and sent to me at Mpumu for identification, presented a morphology and scale of virulence which Dr. Kinghorn, who was staying with me at the time, pronounced in full accordance with the behaviour of *T. rhodesiense*.

Organisms of this type appear therefore to be distributed in wild game throughout the tsetse districts of Africa. In addition to this polymorphic trypanosome, there are other easily recognizable types equally widely distributed. Such are the *T. vivax* and the *T. congolense-nanum* (*pecorum*) groups. These are also found all over the tsetse regions of Africa in both game and fly. In fact, reviewing the *Glossina*-carried trypanosomes in their natural state as opposed to those kept up by means of the syringe in the laboratory, three main groups are easily distinguishable: the *vivax* group, characterized among other things by their uniform morphology; the *congolense* group of stumpy trypanosomes without free flagella; and the group to which belong both the human and the game trypanosomes discussed above. As far as is known none of these organisms exert any evil effect on the game which are their principal hosts.

Turning for a moment to the behaviour of these trypanosomes during their development in *Glossinæ*, it will be seen that the three groups behave each in characteristic manner, no matter what species of *Glossina* is concerned. The *vivax* group affects the proboscis only of the fly; the *congolense* group the gut and proboscis; the polymorphic group the gut and salivary glands. An exception is found in this last group in the *T. pecaudi* of Roubaud, which he describes as occupying gut and proboscis. In the case of the last two groups, until the developing flagellates have reached their anterior station in the proboscis and salivary glands respectively, the flies are not infective.

In one of these three groups, distinguishable roughly on both morphological and developmental grounds, can be placed the great majority of the mammalian trypanosomes of Africa; and the classification is at all events a natural one. When, however, attempts are made further to subdivide the groups difficulties arise immediately, which are, I consider, very largely due to the unnatural way in which the finer tests are applied. If one bears in mind the obvious fact that, with the great majority of the mammalian trypanosomes, every time the parasite enters a new host in nature it does so *via* an insect intermediary, there would be less fruitless wrangling as to the nomenclature of this or that strain. How is it possible to compare the behaviour of a strain kept up by a syringe inoculation for perhaps ten years at a laboratory with one recovered, say, direct from an antelope shot in Central Africa? Miss Robertson, after a careful consideration of the behaviour of *T. gambiense* in the blood of animals infected by the bite of *G. palpalis*, has concluded that there is an *endogenous cycle* of development for this organism in the blood of the mammalian host. This cycle has its morphological expression in a gradual change of the type of trypanosome predominating in the peripheral blood—long, medium or short forms. She considers, from a large number of careful experiments, that there is a direct connection between the various phases of this cycle and the capability of the trypanosome to survive in the *Glossina* host. Briefly, Miss Robertson assigns to the short forms the function of initiating the *exogenous cycle*, as she styles the development in the tsetse; and finds that in feeding experiments conducted with clean laboratory-bred flies, the higher the percentage of short forms present in the blood on the day of feeding the higher the percentage of "positive" flies obtained. This implies a differentiation of function among the individuals present in the peripheral blood of the mammal; which, though it is doubtless influenced by the varying resistance of the host, is also of essential importance in the natural propagation of the trypanosome. Prolonged upkeep of a trypanosome by sub-inoculation ignores the processes which normally determine the spread of the species and must lead to abnormalities.

In a state of nature a trypanosome species gains nothing and loses much by the death of its mammalian host. The biological ideal would appear to be minimal pathogenicity in the mammal combined with maximum capability of surviving in the glossina. In this way the organism is best able to avail itself of every chance of propagation over a long period of

* I employ the term *T. pecorum* as synonymous with *T. congolense*. Bruce's reasons for calling the common Uganda parasite *T. pecorum* and not *T. congolense* are not at all obvious.

time. Such is the relationship existing between the trypanosomes of wild game and their hosts. If the antelope carrying such trypanosomes wanders into a district where the tsetse are incapable of carrying the parasite, the trypanosome will die out with its host. Or if an infected tsetse for some reason or other confines its attentions to victims in whose blood the trypanosome cannot survive, then also the organism is doomed. In nature the principal food of the *Glossinæ* consists almost certainly of wild game, domestic ungulates, man and reptiles. Animals such as dogs, and even monkeys, and the group of so-called small laboratory animals, rats, guinea-pigs, rabbits, &c., will be comparatively rarely met with; the hyena and the jackal may, however, be considered as taking the place of the dog among the game. And yet how much of the diagnosis of species done in European laboratories is based on observations of the trypanosomes in this latter group of hosts—both as regards morphological and pathological evidence? If the behaviour of trypanosomes in these "artificial" hosts were checked by frequent passage through the natural transmitting agent, far less confusion would result and probably very different results be obtained. Arsenic-fast strains, which keep this property in sub-inoculated animals, lose it when passed through the fly. In like manner, doubtless, would the *T. vivax* strain of Yorke and Blacklock lose its newly acquired pathogenicity to rabbits if it were exposed to the natural controlling influence of the tsetse, if, indeed, it has not already lost the capability of surviving in the fly. Some of Laveran's strains have been kept up by sub-inoculation in Europe for ten years, and yet at the end of that time they are still regarded as stock types of natural species.

T. nanum and *T. congolense* (*pecorum*) afford another instance of confusion resulting from insufficient attention to the natural conditions. When first described, *i.e.*, when they were still fresh from passage through the insect host, these two species were distinguished, if by no other test, by their behaviour on sub-inoculation into dogs. The dog has close relatives among wild game in the hyena and the jackal, and the capability of a trypanosome to survive in these animals may thus be regarded as a natural test. In addition *T. nanum* is distinguished from *T. congolense* (*pecorum*) as less pathogenic to domestic ruminants. Kleine and his colleagues recognized this, and I have called attention to the point at Mpumu. Of late, as pointed out by Yorke and Blacklock, these differences between *T. nanum* and *T. congolense*—originally found in strains freshly isolated under natural conditions in Africa—have gradually been eliminated in the course of laboratory upkeep.

In my opinion *T. nanum* and *T. congolense* have far more claim to be regarded as separate species than ever had *T. ugandæ*, *T. brucei*, *T. pecaudi*, &c. In the *morsitans* of the Northern Province of Uganda there occur trypanosomes, some of which answer to the description of *T. congolense*, others to *T. nanum*. Both inhabit gut and proboscis in the fly. By feeding small batches of wild flies on clean dogs and monkeys, and dissecting every fly of each batch, I have recently shown that the greater proportion of the flies with flagellates swarming in proboscis and gut are incapable of infecting these animals—*i.e.*, are infected with *T. nanum*; while the minority infect both dogs and monkeys with *T. congolense* (*pecorum*). In all these experiments the presence of fresh dog's or monkey's blood in the fly's gut at the time of dissection was ample proof of its having fed. Similar results were obtained when the flagellates of the proboscis were injected, and also when the blood of sheep and goats infected with the *congolense-nanum* type of trypanosome was sub-inoculated into dogs or monkeys. Thus in the wild fly of this Uganda *morsitans* country there exist two trypanosomes with the specific characters of *T. nanum* and *T. congolense* (*pecorum*) respectively. The importance of this distinction is obvious when it is realized that carnivora, rodents, and the Anthropoidea are unaffected by *T. nanum* but succumb to *T. congolense*. These two trypanosomes supply an instance of what may well be the origin of two good species from a common stock; *T. nanum*, the least pathogenic, is probably the more primitive type. Here the tendency of laboratory results is to eliminate, as an unimportant variation, a character which natural selection seems to have fixed as a specific difference.

But the tendency which I wish particularly to deprecate is an opposite one, namely, to manufacture specific differences between strains of trypanosomes which natural tests adjudge to be identical. As Yorke and Blacklock point out, the mere fact that certain trypanosomes are known under different names does not exclude the possibility of their being identical. But this admission does the bestowers of the names small credit; and had more attention been paid to the comprehensive study of these various organisms — *T. brucei*, *T. pecaudi*, *T. ugandæ*, *T. rhodesiense*, &c.—such a variety of names would never have arisen. As indicated above, in considering the diagnosis of any trypanosome, the first test to apply is the fly test—how does it behave in the *Glossina* host? Unfortunately evidence of this nature is not available in the case of all the above trypanosomes. In addition to the *T. pecaudi* of Roubaud, which has its anterior station in the proboscis of the fly, there are at least two other trypanosome strains of the same name, the behaviour of which in the fly is at present unknown. These are the *T. pecaudi* of the Sudan and the *T. pecaudi* of Bouffard. It is highly probable, for reasons given elsewhere, that Bouffard's organism is different from the *T. pecaudi* of Roubaud, and it is probable that further investigation will show that it has its anterior station in the salivary glands of the fly. Confirmation of Roubaud's work on the transmission of *T. pecaudi* is also desirable, as it appears to be the only known case of a trypanosome of the "*brucei* group" inhabiting the proboscis of a *Glossina*. As far as experimental evidence goes, all the other trypanosomes of the polymorphic group which are carried by tsetse have their anterior station in the salivary glands, and therefore belong to the same main group.

On further investigation we find that the diseases caused by all of them in their districts of origin are closely similar, as also is their morphology. Why should they not all be looked upon as one species, spread all over Africa, having its anterior station in the salivary glands of *Glossina*, primarily a parasite of wild game, and too pathogenic to domestic animals for these to be regarded as its principal hosts? This essentially is the view held by Yorke and Kinghorn and Sir David Bruce and his colleagues, all of whom base their conclusions on results obtained on the spot. The well-known parasite of man, *T. gambiense*, also has its anterior station in the salivary glands of the fly; but its animal reactions, its unfailing pathogenicity to man, and also—a point which I consider of secondary importance—the absence of posterior nuclear forms, distinguish this organism from the polymorphic trypanosome of game and domestic animals discussed above.

Lastly, as regards the behaviour of these polymorphic game trypanosomes towards man. They are all susceptible to human serum, both *in vitro* and as a prophylactic agent. Under ordinary circumstances they are non-pathogenic to man: that is to say, the natives of the country have a natural as opposed to an acquired immunity. With the opening up of Africa and all it has entailed, increase in traffic and native movements, and the arrival of Europeans, the environment of this pan-African trypanosome has been disturbed to a varying extent in different localities. With increased exposure of human beings to fly bite the chances of occasional establishment in man are increased. Kleine and Taute's view that *T. rhodesiense* and the game organism are different species has been ably criticized by Yorke and Blacklock. A single inoculation experiment such as Taute's cannot decide the question, nor, in my opinion, would fifty similarly conducted experiments, unless of course a positive result were obtained. The contention advanced by the Rhodesia and Nyasaland workers is that the wild game trypanosome is occasionally capable of surviving in man. This must depend on the resistance of the individual: the great majority of human beings are probably naturally immune; or, in other words, the great majority of the trypanosome strains are not, so to speak, as yet within striking range of man. But expose the exceptional human being to the exceptional strain and infection will result. Increase the "Verkehr" in a tsetse region, and you increase the chances of the trypanosome gradually adapting itself to man. And when once man is infected it is quite possible that the human strain so established may acquire pathogenic properties which can survive transmission through *Glossinæ*.

As regards the nomenclature to be adopted in dealing with these wild game parasites, the question is a difficult one. Personally I should like to see all those trypanosomes with a salivary gland anterior station, and with the animal reactions and morphology characteristic of the game trypanosome of Yorke and Kinghorn, described as *T. brucei*. The capacity for existing in man which characterizes certain strains of this *T. brucei* is sufficient to justify a distinguishing title; but until it has been demonstrated that this character survives transmission by *Glossinæ* from man to man, and not merely from game to an occasional abnormally equipped human being, I do not see that the so-called *T. rhodesiense* can claim to be regarded as a good species. *T. brucei* var. *rhodesiense* appears to meet the situation, and to express better the relationships involved. As the matter stands at present the statement made by Kinghorn and Yorke, that 16 per cent. of the wild game in a certain district of Rhodesia are infected with the human trypanosome *T. rhodesiense*, creates a false impression; so, likewise, does Taute's denial of the identity of these game parasites with the organism described by Stephens and Fantham.

Assuming, therefore, that the interpretation of the English workers is the correct one, as indeed seems most probable from a review of the available evidence, it must be admitted that some such modification of the nomenclature as that suggested above is highly advisable.

Kala-azar in Madrid.—Del Diestro (*Revista Clinica e Madrid*, September 30, 1914) reports what he says is the first case of kala-azar published in Madrid. The patient is a boy of 14 months, of healthy parents and antecedents. The family is living now in a healthy third-floor apartment, but until the last three months they lived in a cottage with many trees in an unhygienic quarter. It is unusual for kala-azar to develop so far inland and at an altitude of nearly 2,000 ft., and in a child who has always lived there and has not been in known contact with persons or animals who could have imported the disease, but there is a suspicious case of febrile splenomegaly in a child near the family's former home.

Phenol Camphor for Phlegmons of Joints and Tendon-sheaths.—Schiele (*Zentralblatt für Chirurgie*, Leipsic, October 24, xli, No. 43, pp. 1609-1632) writes to corroborate the great benefit from injection of a mixture of 30 parts liquefied phenol with 50 parts triturated camphor in 8 parts alcohol. He has never witnessed anything suggesting intoxication with this treatment, while his invariable success with it has convinced him that practically always it will abort incipient phlegmonous processes in cavities, especially in large and small joints and tendon sheaths, and the method deserves a trial in gunshot wounds and tardy abscesses. Among the typical cases described is that of a young woman with a phlegmon in the sheath of the flexor tendon of a finger. He filled the cavity with the mixture and the tendon could be exercised without pain, and the three incisions healed without impairment of function. The injection was repeated daily, the tendon swimming in the oily fluid. In another case 5 grm. of the fluid was injected into the knee-joint every second day after evacuation at first of 150 grm. of purulent secretion. The phlegmon had followed an external injury. The pain and fever disappeared promptly, and by the third day the man of 55 was walking, using the knee.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 15, 1915.

PRIZES FOR DESIGNS OF FIELD MOTOR AMBULANCES OFFERED BY MR. HENRY S. WELLCOME.

MANY features new to war have been forthcoming during the present conflict in Europe, and amongst these the extensive use of the field motor ambulance is one of the foremost, and so far as advances in the medical department of the Army are concerned it is, in fact, by far the most important. The clearing of the front of wounded has ever been the aim and object of all those in command of armies in the field, and the endeavour of the medical staff has been to accomplish this with all speed. The work is imperative; for an army having to maintain, carry, and defend its wounded in either advance or retreat, is hampered in its movements and rendered, therefore, less efficient as a fighting machine. As a means to this end the horse ambulance wagon was introduced into warfare and until the present war has been the regulation method of clearing the front of the seriously wounded soldiers. Horse ambulances are now adjudged to be too slow, and have been replaced where possible by the motor ambulance. In most countries (at any rate in Europe) the motor ambulance can go wherever the horse ambulance is likely to be used; it moves more speedily; it is not hampered by the care of horses and their food; it presents a lesser target than the horse ambulance wagon, with its team of two or four horses, for the enemy to hit.

The speed at which the motor ambulance travels allows of the wounded being carried further to the rear of the fighting line; this is an important point in its favour, for whereas a few miles, say four or five, were heretofore considered a suitable distance, now ten times those distances may be covered before the wounded soldier is removed from the vehicle in which he was placed close behind the fighting line. He is borne away from even the sound of guns and carried so far afield that the chances of the enemy suddenly, by even rapid advance, reaching the hospital he has found shelter in are lessened. A sudden retreat of wounded soldiers in front of an advancing enemy is perhaps of all experiences of war the most terrible. There is the dread of being left behind and of being taken prisoner by the enemy; there is the hurried clearance from the hospital when the helpless man is at the mercy of those around him as to his getting away; the pain inevitable to the scramble, the chances of the wounded limb or the recently performed operation wound doing badly, and the mental depression attendant upon the defeat which necessitated the retreat, all conduce to aggravate the wounded soldier's sorry condition and to lessen his chances of recovery to a minimum. With the motor ambulance, however, a long distance from the field of battle can be quickly covered, and any chance of being disturbed by an advancing enemy is known beforehand, so that further movement to the rear can be accomplished more systematically and in greater comfort.

At the present time the types of motors are many, and to fit them for medical work in war is left to the ideas of the individual owner as to what is required. This is, perhaps, conducive to find out the best type required in course of time; but it is expedient that these multiple types should be systematized, and if possible improved upon.

With this purpose in view Mr. Henry S. Wellcome, whose name is a household word in every corner of the British Empire, and to whom tropical medicine owes so much, has come forward and offered substantial prizes for the best design of an "ambulance body" which shall fit a standard pattern motor chassis. This is a step in the right direction, and although it may not settle for all time the type of motor field ambulance wagon, it will bring to a focus the many excellent designs at present to hand, and advance our knowledge so that a standard may be formed and definite principles established. Vehicles suitable for the transport of sick or injured are required, not

only in military campaigns, which are but occasional features of our lives, but also for use in civil life where the necessity is of daily occurrence. In the circular issued by the Ambulance Construction Commission it is stated that this is the first great war in which field motor ambulances have been extensively used. It was inevitable that many defects should be found in existing types, and in various quarters experts began to ask whether something could not be done to standardize the patterns and to improve the type. At the instance of Mr. Henry S. Wellcome, the founder of the Wellcome Bureau of Scientific Research, a Commission has been formed, and the names of members show at once that the matter is regarded as of first importance by those most intimately connected with the welfare of the wounded soldier.

Sir Frederick Treves, whose long experience and distinguished service specially fit him for the task, has consented to be the chairman. The Admiralty is represented by the Director-General of the Medical Department, R.N., while the Quartermaster-General to the Forces and the Acting Director-General, Army Medical Service, represent the War Office. The British Red Cross Society is, of course, represented by Sir Frederick Treves, and the St. John Ambulance Association by Sir Claude Macdonald and Sir John Furley. The remaining members are all experts. This Commission will first and foremost act as a judging committee for the award of prizes of the value of £2,000 provided by the Wellcome Bureau of Scientific Research. These prizes are offered for the best designs of an ambulance body which shall fit a standard pattern motor chassis for field motor ambulances. The last day for the receipt of competing designs is June 30, 1915. It is hoped that the competition will bring in a number of ingenious designs, from which the ideal field ambulance body will be evolved.

It may be asked why the competition is restricted to designs for a body and not for the complete ambulance, including a chassis. The reason is that a chassis takes much longer to build than a body, and that, when war breaks out, it is impossible to get at short notice anything like a sufficient number of any one type of chassis. On the other hand, a standardized body to fit any chassis of approved dimensions can be constructed in numbers at comparatively short notice: and a perfected body is badly wanted to ensure complete comfort for the wounded.

It is hoped that the information obtained by the competition, and in other ways, will be published in some permanent form, available for future reference. Probably in addition to one design of special excellence, there will be submitted various ingenious suggestions which may be incorporated in the pattern design approved by the Commission. For these a portion of the prize money has been set apart. The first prize is of £1,000, the second of £500, and the third of £300. All details of conditions may be obtained from the Secretary, the Ambulance Construction Commission, 10, Henrietta Street, Cavendish Square, London, W. The competition is open to citizens of all nations.

Abstract.

THE WAR AND TYPHOID FEVER.*

By Sir William Osler, Bt., M.D., F.R.S.

I.

(1) The Importance of the Individual Case as a Factor in Infection.

In surgery, we have changed the antiseptic to an aseptic battle, and nowadays the physician feels as keen a duty to keep the surroundings of a patient sterile as to treat his symptoms.

This in itself is a great gain, as the possibility of the abolition of the disease is a problem of the sterilization of the individual cases as they occur. As to the question of the methods of conveyance it is sufficient to say we have recognized fingers and flies as two of the chief, and the special liability in houses and wards of food contamination.

(2) Recognition of the Protean Character of the Disease.

Not only are there differences in the germ that causes the clinical picture of typhoid. but the clinical picture itself varies from the text-book standard very much. A transient febrile attack, a slight diarrhœa, bronchitis, acute nephritis, an attack of pneumonia, cholecystitis, acute pyelocystitis, may be a manifestation of the infection. In endemic areas mild, indefinite illness in children may be due to the typhoid bacillus. The organism, indeed, may lodge and live in an individual without ever causing symptoms, and then acutely excite an illness without a trace of resemblance to the disease we usually associate with its name. One of the first cases in which this was recognized was a woman, aged 26, who had a clean bill of health except for occasional attacks of abdominal pain and vomiting. It was evident at the time of examination that she had an acute cholecystitis. Fifteen large gall-stones were removed; pure cultures of the typhoid bacillus were isolated from the mucous contents of the bladder. Here was a woman who had never had, as far as could be ascertained, typhoid fever, and yet she had probably had for years the organism in her gall bladder which had ultimately caused the formation of the stones. In the Spanish-American war, and in the South African War, there were an extraordinary number of mild ambulatory cases, which in the former were frequently reported as malaria. In public health work it is all-important to recognize these mild atypical cases. At Glasgow eight cases of enteric appear to have originated from an undetermined case of intestinal catarrh in a child.

(3) The Discovery of Typhoid Carriers.

Briefly stated, in from 1 to 3 per cent. of cases of enteric fever the bacilli do not disappear from stools or urine. The patient becomes a chronic carrier and a possible menace to the community. It has been

* From the *British Medical Journal*, November 28, 1914.

estimated that, in countries in which typhoid fever prevails, the typhoid carriers number from 2 to 3 per 1,000. Infectivity may exist for years, and scores of small epidemics have been traced to carriers. How persistent the infection may be, and how difficult to get rid of, is well illustrated by the case studied for the past five or six years at Bristol. The patient had enteric in July, 1905, and eight instances of infection had been traced to her. The special interest in the case is the careful study of the different plans of treatment and the variability of the presence of the organisms in the urine. They were also isolated from her blood five years after the original attack. The relation of the carrier to public health is of vital importance, particularly the question of the detention of notorious carriers who follow dangerous occupations. The New York Board of Health was judged to be within its rights when an action was brought against them for the illegal detention for three years for the celebrated "Typhoid Mary." Carriers should not follow the occupation of cooks, butchers, grocers, as the fingers deposit bacilli on everything they touch unless scrupulous attention is paid to cleanliness after defæcation. The good effect of precautionary measures in the case of chronic carriers is illustrated by the report of Lentz from the Oberstein district. For ten years the disease had been endemic, and then a systematic attempt was made to discover the carriers, of whom six were found in 1894, two in 1897, and one in 1898. They were practically all mothers with large families. It was impossible to enforce vigorous methods of isolation, so that repeated warnings were given, and instructions as to scrupulous cleanliness, particularly after defæcation, never to touch an article of food without a systematic washing of the hands, and having their underlinen carefully sterilized. The fever in the district has practically disappeared.

(4) Immunization.

Lastly, and the most important point of all, is the discovery of immunization against the disease. The net result of the enormous amount of work which has been done is that, for a time at least, man may be immunized safely and surely. It is only by the statistical method that we are able to judge of the results of the practice.

For many years the death-rate from typhoid fever in the United States has been very high. The disease prevails widely in the country districts. During 1912 it was 16·5 per 100,000 of the population—the lowest for many years. Antityphoid inoculation was voluntary in the United States Army from 1909 to part of 1911: it was made compulsory in part of 1911 and in 1912 and 1913.

No harmful effects have been produced. The value of these results must be taken in connection with the fact that in many places the barracks are situated in districts in which typhoid fever prevails. In 1911 and 1912 there was a concentration of many thousands of United States troops on the Mexican border in localities quite as favourable to the spread of enteric as in the Spanish-American War.

Typhoid Fever, 1907 to 1913, for the Whole Army, Officers and Enlisted Men, American and Native Troops.

Year	Mean strength	Cases		Deaths		Per-cent-ages of total cases	Occurring among those who were vaccinated	
		Number	Ratio per 1,000 of mean strength	Number	Ratio per 1,000 of mean strength		Cases	Deaths
1907	62,523	237	3·79	19	0·30	8·0	—	—
1908	74,692	239	3·20	24	0·31	10·0	—	—
1909	84,077	282	3·35	22	0·26	7·8	1	0
1910	81,434	198	2·43	14	0·17	7·1	7	0
1911	82,802	70	0·85	8	0·10	11·4	11	1
1912	88,478	27	0·31	4	0·044	14·8	8	0
1913	90,646	3	0·03	0	0·0	0·0	1	0

The special value of the experience of the American Army is the remarkable drop in the case incidence which followed antityphoid inoculation without special change in the sanitary environment of the troops. An interesting comparison is reported of two divisions stationed in nearly the same latitude for about the same length of time each on a good site, with artesian water of unimpeachable purity. In the one at Jacksonville, Florida, in 1892, among 10,759 men there were 1,729 certain cases, probably 2,693 (the question of diagnosis of typho-malaria, &c.), with 248 deaths. At San Antonio, Texas, in 1911, among 12,659 men, all inoculated, there was one case of typhoid fever, and no death. In France the results appear to be equally satisfactory, and there is no country in which measures of protection are more needed, as during the past twenty years among the French troops in France there have been 66,000 cases, with 10,000 deaths. Professor Vincent reported to the International Medical Congress last year that among 30,325 vaccinated men no cases occurred, while in the unvaccinated the case-rate was 2·22 per 1,000 in the metropolitan troops and 6·34 in the colonial. Specially good results have been met with in Algiers and Morocco, where the inoculation is compulsory, and the incidence per 1,000 has fallen from 15 to 5. A striking illustration is reported from Avignon by Paget in a recently issued Research Defence Society pamphlet. Out of 2,053 men 1,366 were protected and 687 were not. The non-protected had 155 cases with 21 deaths; the protected had not a case. The Italian experience in Tripoli shows that the incidence of the disease among the unvaccinated was 35·3 per 1,000, while among the vaccinated the incidence for those inoculated once was 1·34 per 1,000, for those inoculated twice 1·65, and for those inoculated three times 0·49. The most careful study of the statistics for the British Army are those presented in the report of the Antityphoid Committee, 1912. "The histories, as regards typhoid fever, of 19,314 soldiers, whose average period of service abroad was twenty months, were carefully followed, and every precaution possible was taken to verify the diagnosis bacteriologically. Of this number 10,378 were inoculated and 8,936 not inoculated. The case incidence of typhoid fever among the inoculated was 5·39 per mille, and among the non-inoculated 30·4 per mille.

"There is no reason for supposing that this difference can be attributed to a want of homogeneity between the two groups. The age distribution among inoculated and non-inoculated was approximately the same. They were intermingled and lived under identical conditions."

Symptoms following Inoculation.

In the first place it may be stated that with ordinary care and precautions large bodies of troops may be successfully inoculated with extraordinarily little discomfort or disability. Colonel Hodgetts has kindly given me the figures of the recent inoculations of the Canadian contingent, some 31,000 strong, made under his supervision in the camp at Valcartier in the Province of Quebec. Of the total number only one had a local abscess at the site of injection, and there were no serious sequelæ. This may be said to be an exceptionally good record. The inoculations in this country during the past three months have been on a larger scale than ever before attempted, and considering the enormous number—several hundred thousand—the serious sequelæ have been very few. We may group the symptoms as follows:—

(1) A varying proportion no symptoms, other than a little headache or malaise, with slight redness and swelling at the point of inoculation.

(2) A large proportion run a normal course of what may be called the inoculation fever, which has many resemblances to the so-called serum sickness. The temperature rises within ten or twelve hours, sometimes with a slight feeling of chilliness, and vomiting may occur. There are headache, fugitive pains in the back and joints, sometimes abdominal tenderness, and for twenty-four or thirty-six hours the patient may feel very badly. In mild forms the temperature rises to 101° or 102° F.; in the more severe to 103° and 104° F., or even higher. Sometimes there is diarrhœa; in other cases, perhaps in the majority, there is constipation. Giddiness and fainting are reported, and one physician within the first ten days had curious nervous symptoms, feelings of apprehension, and a transient state of neurasthenia. He felt inability to control his muscles, and dreaded lest he should be unable to avoid some impulsive act. There was a slight mental disturbance, and he had what he called "dreadful feelings," and had difficulty in forcing himself to do the simplest acts. In the North Midland Division, among nearly 16,000 inoculated, a man, two days after inoculation, had marked mental symptoms suggestive of confusional insanity, which, fortunately, passed away. I saw with Dr. Collier an officer whose case was very fully reported to us by Dr. Joyce, of the 4th Royal Berkshire Regiment. He was inoculated on September 14, and, after the usual slight local and general symptoms on the 17th the temperature was normal. On the 18th he had giddiness, and on returning to his billet when the door was opened he mistook the parlourmaid for the colonel, and raising his hand to the salute overbalanced and fell unconscious. He had a few days' leave, and some weeks later had several giddy attacks. He got quite well.

Heavy exertion and exposure within twenty-four hours after inoculation may be followed by sharp general symptoms. In connection with the abdominal pains that may occur, it is interesting to note that Professor Boyd, of Winnipeg, now associated with the 3rd North Midland Field Ambulance, reports two cases (admitted on the same day) with appendicitis—one on the third day after inoculation, the other within twenty-four hours. Both had acute perforation. There have been several reports of sharply localized pain in the region of the cæcum, with slight diarrhœa. The highest temperature recorded was 106·4° F., four days after inoculation.

In what may be called the normal course there is œdema and redness at the site of inoculation varying in extent, and several correspondents have noted a curious migration of the erythema downwards towards the elbow, and even reaching to the wrist. Blotchy erythema may occur about the joints, and purpura has been noted.

Cases with Untoward Effects, Local or General.

(*a*) *Locally*, the redness, swelling, tenderness rarely persist for more than a day or two, and may be equally marked at both inoculations, or may be slight at the first and abundant at the second or *vice versa*. The local process may go on to suppuration. How rare this is may be judged from the experiences of the Canadian contingent already referred to, in which only one abscess occurred among some 31,000 cases. This is, indeed, a remarkable record, as I doubt if there is any hospital in the kingdom in which during a year's experience abscess does not follow some form of hypodermic injection. I have had no report of severe sepsis following the local abscess. One case had a septic wound, which proved to be an abscess following ordinary vaccination for small-pox, and the report states that the bad arm directly followed from his own neglect.

(*b*) *General*.—The inoculation fever and its symptoms rarely last more than a couple of days; but in a few cases unpleasant, or even serious, complications may follow.

With the fever there may be pains in the joints, superficial redness, and even effusion. A patient was admitted to the base hospital, Oxford, with effusion in the left knee following antityphoid inoculation three weeks previously. It resembled a gonorrhœal synovitis, but there was no urethral discharge. I have already referred to the abdominal pains on pressure in the cæcum region and the coincidence of appendicitis in two cases. Jaundice has been noticed in a few instances. There were four in the North Midland Division, coming on about a week after inoculation. Symptoms suggestive of enteric, and even enteric itself, may follow inoculation.

At Brighton, a second inoculation on October 13, followed by headache and pains in the limbs on the 14th, then fairly well until the 20th, when he had headache, a temperature of 103·4° F.; on the 21st the temperature ranged from 101° to 102° F., on the 22nd from 98·6° to 102° F., then gradually fell to normal.

On the 26th the tongue was very furred, there were no spots, but there was a positive Widal reaction on the 24th. The case was not treated as enteric.

Inoculation has been followed by an illness not to be distinguished from typhoid fever.

In a case the second dose, given on October 16, was followed by sickness and giddiness. On October 19 and 20 he had diarrhœa, for which he saw the regimental medical officer. On October 23, he was seen by the surgeon of the 1st North Midland Field Ambulance, who found him with a temperature of 101·5° F., constipation, rose spots, slight abdominal tenderness, large spleen. After consultation, it was decided that it was a typical typhoid case, and he was sent to the 2nd General Hospital, London.

At Brighton, Private Walter Fuller, aged 23, had his first inoculation on October 3. Slight headache on the 4th, with fugitive pains, but he did not feel badly until the 7th, when there were fever and pains in the joints. On admission to hospital on the 9th the temperature was 102·5° F. On the 11th his temperature was 104° F., much pain, particularly in the joints, slight swelling and redness of the ankles and the smaller joints of the hands, with great stiffness and inability to use the muscles. On the 17th he began to have pain in the chest, with signs of involvement of the right base. On the 18th the leucocyte count was 15,300 per cm., the pains in the chest were worse, he had cough, and the consolidation in the right lower lobe had increased. The Widal reaction was markedly positive. Between the 16th and the 23rd the temperature rose to about 103° F. each day, there were pain and swelling in the joints, redness over the ankles and knuckles, and much disability. When I saw him on the 23rd he looked very ill, the respirations were 40, pulse 100, the small joints of both hands showed swelling with slight erythema, tenderness on pressure and on movement, redness over the left ankle, moderate effusion in the left knee-joint and right elbow, consolidation of the right lower lobe, and left pleural effusion reaching to the fourth rib in front. The heart sounds were clear; the spleen was not palpable. There was no redness or swelling at the site of inoculation. The patient remained very ill for the following week, although the temperature was lower, rarely going much above 102° F. There was a to-and-fro pericardial murmur. The patient then began to improve, and on October 30 the temperature for the first time fell to 99° F. Between October 30 and November 5 it fluctuated around 100·5° F., and then fell to normal. The smaller joints remained painful, and it was not until November 11 that he began to use his hands and arms. He is now convalescent.

In the same ward was a man with dermatitis in the region of one axilla, which had spread rapidly after inoculation. He had symptoms suggestive of peripheral neuritis, stiffness of the arms, and loss of the knee-jerks. He had had zinc ointment used for a very large area, which might possibly be the cause of the neuritis.

The importance of avoiding exposure for a day or two after inoculation is emphasized by the fact that cases of pneumonia have been reported by several observers. In the North Midland Division series among nearly 16,000 instances, in two cases lobar pneumonia followed within twenty-four hours. Pneumococci were present in the sputum in both cases.

Private G. B. Jones was inoculated October 6: chill on the 7th, and on the 8th was admitted to the 2nd General Eastern Hospital with pneumonia of the middle and lower lobes on the right side, and the lower lobe on the left, with a temperature of 103° F., pulse 120, and much delirium. He had a very severe illness, and died on October 14.

The Beaujon Hospital nurse, Paris, whose case is so often quoted, died of typhoid fever a month after the last inoculation. She might very possibly have contracted the disease previously. The Neckar hospital nurse received therapeutic injections of typhoid serum during the course of the disease, not a protective inoculation.

Private Pantzer, of the National Guard, Brooklyn, died of malignant endocarditis, and the inoculation had nothing to do with his fatal illness.

II.

Perhaps the best chapter in British sanitation is that which deals with typhoid fever. While a decrease in the incidence of the disease has been more or less general throughout civilized countries, nowhere else has the fall been so progressive and striking. Twenty years ago the death-rate per 1,000,000 of inhabitants was above 300; in 1912 it had fallen to 44, the lowest ever recorded; indeed, up to 1904 the rate had never fallen below 100. Enteric fever may be said to be in its "last ditch," but that it is still putting up a strong fight is indicated by 1,600 deaths in England and Wales in 1912. It prevails less in London than in the Midlands and in the South, and is much more frequent in the North in both urban and rural districts. In certain urban districts the highest case-rate per 100,000 of the population was 34. In many of the large cities in the North, as in Liverpool and Glasgow, in which the disease was very prevalent, the fall has been progressive and rapid. In the former city in 1895 there were 1,300 cases. In 1911 it had fallen below 200. In Glasgow the case-rate per 1,000,000 has fallen from 1,386 in 1891 to 232 in 1913, and the death-rate per 1,000,000 from 218 in 1891 to 36 in 1913. General betterment of sanitation, particularly improved housing, better diagnosis, greater care of the individual cases—to these factors may be attributed a large part of this decrease. But there is another to which the attention of medical officers of health has been strongly directed—namely, the removal of local sources of infection by the isolation of the sick in hospitals, in which in some cities the proportion of cases treated has risen from 30 or 40 per cent. to 80 and 90 per cent. It has been well said that enteric fever is the sanitary index of a country; and that tó-day our camps are not hotbeds of the disease is a result of more than half a century of intelligent and efficient sanitation. Neither the profession nor the people at large appreciate fully the extraordinary sanitary advantages enjoyed by this country.

The most striking difference between England and

the United States and Canada, is the absence of enteric fever in hospital and private work. The tragedy of typhoid fever was ever present, and one felt constantly outraged at the wantonness of the sacrifice. In full measure the tragedy was brought home to the United States during the Spanish-American War. There never has been in history a campaign so fatal to an army not yet in the field. Listen for a moment to the story of what may happen after mobilization in a typhoid-ridden country. In six months, among 107,973 men, there were 20,738 cases of typhoid fever and 1,580 deaths. At Camp Alger, near Washington, with a mean strength of 21,988 men, there were 1,951 cases of typhoid fever. Never have I seen so many cases of fever concentrated together, barrack after barrack filled with the victims of neglected sanitary precautions. The lesson drawn from this epidemic was that the disease was not water-borne, but that nearly two-thirds of the cases were examples of "connectible attacks"—that is, due to infection within the tent or from adjacent tents. It was the first great epidemic to call attention to the importance of local infection by means of fingers, food, and flies. Two other points were brought out —the frequency with which erroneous diagnosis was made, particularly in the southern camps, where many cases were supposed to be malaria; and the large number of minor attacks indicated by nothing more than transient malaise, slight fever, or a gastro-intestinal attack.

Recommendations.

More than three months have passed, and the reports from the camps indicate that nowhere is typhoid fever prevalent. That isolated cases have occurred should make the medical officers of health and the military surgeons redouble their efforts to prevent the spread. These should be watched with the utmost care, since epidemics in camps are usually preceded by scattered cases or by the unusual prevalence of diarrhœa. *Watch the common ailments*, should be the motto of the camp surgeons. The following measures are indicated:—

(1) Every recruit should be asked whether he has had typhoid fever, or if during the previous twelve months he has lived in a house with a case of fever. An affirmative answer should mark the man for laboratory study. This may seem an irksome precaution, but in preventive medicine nothing necessary is irksome.

(2) A realization of the extremely protean character of typhoid fever, so that mild cases of enteritis, obscure forms of bronchitis and pneumonia, and mild cases of fever should be watched with care.

(3) Every typhoid patient should be regarded as a focus of infection, and should be suspect so long as the bacilli are present in the discharges. The cases should not be treated in the general wards with other cases. Measures should be taken in the larger camps and in the garrison towns to segregate the cases.

(4) No typhoid patient should receive a clean bill of health until he has been shown by bacteriological examination to be harmless.

(5) Ample provision should be made for the careful bacteriological examination of all suspected cases.

III.

Fever in various forms has proved more destructive to armies in the field than powder and shot. It has been well said that bullets and bacilli are as Saul and David: "Saul hath slain his thousands and David his ten thousands." The story of the destructive character of fevers has never been so well demonstrated as in the great Civil War of the United States, during which malaria, dysentery, typhoid fever, and other diarrhœal diseases were the fatal foes. The official figures for the Army of the North are sufficiently appalling—79,455 cases and 29,336 deaths! There is the same story in the Franco-Prussian War; among the German troops there were 8,000 deaths from typhoid fever, 60 per cent. of the total mortality! It is said that typhoid fever existed in every army corps at the outbreak of the war, and the campaigns were carried on largely in infected regions. The sad memories of the South African War still haunt the memory. That was a war which brought out many new details in campaigning, but the sternest lesson taught is the one we are now considering, as it, too, was a war in which the bacilli counted for more than the men. Of the 22,000 lives lost, the enemy is debited with only 8,000; preventible febrile diseases for 14,000. And among these, as usual, typhoid fever headed the list: 57,684 cases, of whom 19,454 were invalided, and 8,022 died. The *Bacillus typhosus* alone did more damage than the Boers. Here again, as in the Spanish-American War, it was not so much water-borne typhoid as camp infection by fingers, flies, dust, and food.

We are now in the fourth month of the war, and so far as one can gather from the somewhat meagre reports, the health of the troops at the Front has not been damaged to any extent by fever, and, so far, the sad losses have been from bayonets and bullets. On active service the soldier may take typhoid fever with him, or he may find it in the country. A large body of men has a certain percentage of carriers, any one of whom may act as a focus of distribution. The conditions in camp life are peculiarly favourable to case infection; thus it would be impossible for a carrier cook not to contaminate the food of an entire company. Of equal moment is the state of the country in which the troops are working. During the Spanish-American War it was not possible in the United States to locate a camp in a typhoid-free position. In this country it is not possible to pitch a camp in an infected district. In South Africa both conditions prevailed; infection was brought by soldiers, and was abundant in the country. It seems not unlikely that the troops in France and Belgium are reaping the benefit of the past ten years of active campaign against typhoid fever. Details are not at hand as to the prevalence of the disease in the eastern and north-eastern regions of France, but there has been a great reduction in the incidence of the disease in Belgium, and the troops have heretofore suffered but little. The Rhenish provinces should reap the benefit of the remarkable antityphoid

campaign of the past ten years. Certainly it is very gratifying, particularly at this season of the year, that comparatively few cases have occurred. Among 2,000 German, English, and Belgian troops who have been, or are at present, in the base hospital at Oxford there have only been five cases of typhoid fever; and this, I believe, to be the experience in other large hospitals throughout the country. It will be a great triumph to go through this war without a devastating experience of typhoid fever. In the fighting line it is not possible always to ask the soldier to carry out sanitary precautions, and in a very infected country, even with the best of intentions, he cannot avoid exposure. Here we may expect to find the protective value of inoculation, and it is very satisfactory that the value of the measure has been so generally recognized by officers and men. An immense proportion of those who go with the Expeditionary Forces will have been protected—for a period at least. While with our present knowledge we cannot but regret that the inoculation has not been made compulsory, let us hope that a sufficient number have taken advantage of the procedure to make impossible a repetition of the enteric catastrophe in South Africa.

We shudder at the needless slaughter of the brave young fellows—Allies and foes alike—but think of the slaughter which goes on in our homes, just as cruel as, often more cruel than, that of the battlefield! Tuberculosis alone will kill ten times as many this year in Great Britain than will die abroad for their country. Comparing the death-rate in England today with that of fifty years ago, we may say that, as a result of the work of the other army, more will be saved from death by enteric fever in 1914 than will be killed this year in the war. Eberth's *Bacillus typhosus* will kill in 1914 in the United States more than will German shrapnel and bullets in France and Russia.

Annotations.

Rhinosporidium Kinealyi.—T. S. Tirumurti (*Practitioner*, November, xciii, No. 5, pp. 704-719) says the parasite is found in other situations than the nose, though the nasal mucous membrane is its favourite site. The occurrence of the sporozoon in the conjunctival and nasal mucous membrane is explained by direct inoculation through infected clothing, handkerchiefs, or the hands. The spores are discharged in the nasal secretion, which is rather profuse in patients who suffer from this parasitic polypus in the nose, and who are subject to chronic nasal catarrh and profuse bleedings from the nose.

The growth of the parasite being usually one of long duration, the source of the infection is forgotten and a history of close contact is not easily elicited. The preponderance of the parasitic cysts in large numbers, mainly in the epithelial and subepithelial tissues, is also suggestive of this mode of conveyance of the disease by infected nasal secretion. The occurrence of the parasite in the penis in a man who was otherwise healthy and showed perfectly normal appearances of the conjunctiva and nasal mucous membrane, is very suggestive of direct inoculation through sexual congress.

Rhinosporidial polypi may occur in the mucous membrane of the mouth, anus, and vagina, but are overlooked, microscopic examination not being conducted in every case. The growths have a great tendency to recur, though after their removal the bases are cauterized. Thorough cauterization may prevent a recurrence. The clinical features of the growths are characteristic, though the characters are modified according to the site of their occurrence. The recurrence and innumerable number of cysts of the parasite, in different stages of development in a small fragment of the tissue affected, are in favour of the sporozoon undergoing its complete cycle of development in the human body without the intervention of an intermediary host.

Dysentery.—G. Singer (*Medizinische Klinik*, Berlin, November 1, x, No. 44, pp. 1633-1654) says that in this disease there is a large area of pathologic surface, and that the task is to keep this surface well drained and prevent accumulation of secretions at any point. The diarrhœa is an effort to accomplish this, and needs aid by copious flushing out of the bowel. He uses a soft two-way tube and can thus flush the bowel with three or more litres, without discommoding the patient, until the fluid comes away clear. He commends bolus alba or charcoal as an important aid. The bacilli are liable to settle down and hibernate, as it were, for years. This is probably the true cause of chronic ulcerative colitis in some cases.

Symptoms and Treatment of Tetanus.—Blumenthal (*Medizinische Klinik*, Berlin, November 1, x, No. 204) says the importance of an early diagnosis of tetanus on account of the pains and twitching in the muscles around a wound liable to be infected with tetanus germs should give the alarm at once and call for preventive injection of antitetanus serum. These slight pains in the region are usually ascribed to rheumatism. Trismus is by no means the first sign of tetanus, although it is, of course, the first unequivocal sign. Voelcker (*Münch. med. Wochenschr.*, Berlin, October 27, lxi, No. 43, pp. 2125-2160) uses a combination of antitetanus serum, subcutaneous injection of 5 c.c. of a 2 per cent. solution of phenol, *plus* local cauterization of the wound with concentrated phenol. This does not produce an eschar at once, to impede its action on the tissues, so it burrows deep and effectually sterilizes. He reports four cases of tetanus after shrapnel wounds in which this method of treatment was successfully applied. The trismus came on from the ninth to the fourteenth day after the injury. He gave the subcutaneous injections once or twice a day at first, increasing to five or six a day. Eunike reports ten cases of tetanus among the 3,000 wounded in his charge at Ludwigshafen. The incubation was from nine to twenty-one days, and five of the men died.

He warns that the early symptoms are liable to be ascribed to rheumatism or be disregarded, and thus precious time is lost.

The Supply of Dressings. — D. Krecke (*Münch. med. Wochenschr.*, Berlin, October 27, lxi, No. 43) points out the necessity for economy in dressings for wounds, and he suggests various fibre-woven materials that might be used instead of cotton for dressings. To emphasize the need for economy, he remarks that losses up to 50 per cent. must be reckoned with in this war. In the Franco-Prussian War the losses averaged 18 per cent.; in the Manchurian campaign the Russian loss was 29 per cent. and the Japanese 40·9 per cent.; but in the present war, he continues, "With 2,000,000 fighting, we must look for losses of 1,000,000. How large a proportion of this will be composed of wounded we have no means of estimating, but it is certainly not exaggerating to say that we can reckon with half a million wounded in the course of the first year of the war."

The Explosibility of Grain Dust.—H. H. Brown (*Journ. Indus. and Engin. Chem.*, 1914, vi, 934) investigated thirteen explosions which occurred in grain mills and similar industrial plants in very recent years: at least seventy-eight men were killed and 119 injured. Incidentally, the total damage to property exceeded £400,000. In four other explosions the human loss is expressed by forty-seven killed and 119 injured. Most, if not all, grain dusts are more inflammable than coal dust (which has long been recognized as a source of danger). Grain dusts in most cases develop higher pressures on explosion. The preliminary observations seem to indicate that the dusts from oats and yellow corn are more inflammable than those from wheat and other grain.

The investigations indicate a difference in the inflammability of dried and undried dusts. In nearly every case the pressure developed on explosion was increased appreciably after drying. The result of a decrease in the humidity of the air is thus suggested.

Various causes have been assigned to many of the explosions in milling plants in this country and abroad, among them the use of open lights, or naked flames, such as lamps, torches, gas jets, lanterns, candles, matches, &c.; property fires; introduction of foreign material in grinding machines; electric sparks from motors, fuses, switches and lighting systems, and static electricity produced by friction of pulleys and belts, grinding machines, &c. A large number of the recent explosions and fires have been caused by the introduction of foreign materials into grinding machines. It would appear that a possible means of prevention would be to devise some system by which the foreign material might be removed before it reached the mill. For the present, it is recommended in a practical way that prevention of explosions may be assisted by complete electric-lighting systems, the use of portable electric lamps instead of lanterns or naked lights, the enclosing of the electric-light bulbs in strong wire guards or protectors, and the possible use of vapour-proof globes, and the locating of all fuses, switches, starting-boxes, motors, &c., at points where no dust is present. It is also advised to have the receiving bins from the grinding machines as small as practicable with the operations, as increased size gives increased space for dust clouds and, therefore, opportunity for a more violent and destructive explosion.

Epidemic of Streptococcus Sore Throat in Jacksonville, Ill., traced to Milk of Cows affected with Streptococcus Mastitis.—J. A. Capps and D. J. Davis (*Archives of Internal Medicine*, Chicago, November, xiv, No. 5, pp. 609-768) report there were 348 cases of sore throat in the series investigated, most of them complicated by enlargement of the cervical glands and many by a marked exudate. Cultures from a number of throats showed a hæmolytic streptococcus. In 913 households, in 60 per cent. of the cases of sore throats, milk or cream from Dairy X was used, although this dairy supplied only 17·5 per cent. of the households. The morbidity rate in one institution supplied by Dairy X was 40 per cent.; in four other institutions supplied by other dairies it averaged 1·7 per cent. Among 1,000 customers of Dairy X, 215, or 21·5 per cent., developed sore throat, whereas among 6,416 customers of other dairies, 133, or 2·1 per cent., developed the disease. As a result of a systematic inspection of 416 cows on thirty-eight dairy farms, eleven cows with garget were found. Bacteriologic examinations revealed hæmolytic streptococci in the milk of two of these diseased cows. The milk of both of these cows was distributed by Dairy X. As Dairy X did not pasteurize the cream at all and the milk very inadequately, the streptococci originating in the bovine mastitis were probably responsible for the epidemic. Because of the extensive distribution of ice cream, manufactured from the Dairy X cream, ice cream played an important *rôle* as a carrier in this epidemic.

Notes and News.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT. FORTY-SIXTH SESSION.
OCTOBER—DECEMBER, 1914.

W. I. ESCOFFERY[1], M.B., B.Ch.Aberd. (Colonial Service), with distinction. G. C. S. Perera, L.M.S. Ceylon (Colonial Service.) A. E. Schokman, M.R.C.S., L.R.C.P. C. Deuntzer, M.R.C.S., L.R.C.P. E. F. Wills, M.B., C.M.Edin. J. E. Moffatt, M.R.C.S., L.R.C.P.Irel. (Colonial Service). E. B. Bate, M.B.Dub. (Colonial Service).

December 21, 1914.

[1] Dr. Escoffery has been awarded the "Duncan Medal" of the London School of Tropical Medicine, this being awarded to the student who obtains the highest aggregate of marks during the session.

Original Communication.

THE IMPORTANCE OF TERTIARY YAWS.

By R. Howard, M.D.Oxon.

It has been my lot to work for over fifteen years in different parts of Central Africa, between Lake Nyasa and the East Coast in the neighbourhood of Zanzibar. In all these regions yaws is a common disease, but for the most part it is either not treated at all, or else treated with quite inadequate native remedies. The frequency with which tertiary symptoms occur and their important influence on the disease incidence of the community has been forced more and more upon my notice. So far as I can judge from papers dealing with the disease conditions in Central Africa and elsewhere, and from the returns in the Colonial Medical Reports, the possibility of tertiary symptoms developing some considerable time after the cure of the primary attack of yaws is to a great extent ignored. I imagine that a very large number of such cases are returned as tertiary syphilis, and would point out that statements by travellers that a given population in Africa is "riddled with syphilis" [5] must be received with great caution in regions where yaws is a common disease. In many parts of Central Africa nearly 50 per cent. of the population have suffered from yaws, and so it would appear to be unwise to diagnose tertiary syphilis until tertiary yaws has been definitely excluded. In this connection I may mention that as far as my experience goes it is not generally difficult to get a reliable history from a native as to whether or not he has had yaws. It is true that he may have had it as a baby and not remember it, but otherwise the occurrence of a disease which probably lasted about a year, which gave rise to much discomfort, and caused him to be more or less shunned as infectious, is hardly likely to be forgotten. Moreover, native diagnosis of this complaint is generally singularly accurate, even in early cases before the rash has developed fully, and also in atypical cases when infection has been engrafted in some other form of chronic ulceration. Among the Nyasas it is called "Vyangalala," among the Yaos "magaugau," among the Bondeis "guma," and among the Swahilis "buba," the latter word being the most widely known. Syphilis, called in Swahili "kaswende," is much less reliably diagnosed, probably on account of the polymorphic character of the secondary stage. Nothing short of a severe rash with extensive ulceration in the region of the genitals is called "kaswende," and I remember a case where a native boy who had a typical secondary papular and scaly syphilide, with sore throat and general adenitis following on a hard chancre, was most indignant when I maintained that his disease was really "kaswende."

In 1899, when I first began work on the east side of Lake Nyasa, I found that yaws was a common disease, well known and recognized, but of somewhat patchy distribution, due apparently to local infection in villages. Syphilis, both acquired and congenital, was rare, and for the most part limited to those villages which were on the track of the caravan and trade routes to the coast, whence the infection had been introduced.

I soon found, however, that more and more tertiary cases came into my hospitals, and noticed that these were all from the regions where yaws was frequent. In 1908 [7], I wrote a short paper on "Tertiary Yaws," in The Journal of Tropical Medicine (vol. xi, p. 198). At that time the sequelæ or tertiary symptoms of yaws were scarcely mentioned in either Manson's or Scheube's text-books of tropical diseases. Papers on the subject had appeared, giving full descriptions, chiefly based on experience in Fiji and the West Indies [4], [9], [1]; but by many writers such symptoms were, without any evidence, attributed to a syphilitic taint. Since then a concise account of the tertiary stage of yaws has been given in "Castellani and Chalmers' Manual" [2]; but not even yet can it be said that the condition is generally recognized; at any rate the list of the Colonial Medical Reports supplies no sub-heading for tertiary yaws as it does for tertiary syphilis.

In 1910 I moved to Zanzibar, and since then have had occasion to make medical visits to two parts of German East Africa, viz., the Bondé country, 30 miles inland from Tanga; and the region of Newala, 90 miles inland from Lindi. In the Bondé country I found that yaws was even commoner than at Nyasa. Fully 25 to 50 per cent. of the inhabitants gave a history of it, and the disease is still very prevalent, though occurring for the most part among children. Tertiary symptoms are marked, and the natives seem to recognize that these have some connection with yaws, and call them "kambako," though it must be admitted that under this name they included other chronic complaints of quite different origin.

In the other district, which I first visited in 1911, yaws seems to be of much more recent introduction, and to have assumed almost an epidemic character. Native report says that it was introduced about twenty years ago. It is noticeable that a number of adults are affected as well as children. I saw a few tertiary cases, and was informed that the natives called it "mbelegu," or "kina," and that it was incurable by their remedies. A few cases were persuaded to come into hospital, and I treated them with potassium iodide with very satisfactory results. When I paid a second visit to this part of the country in the middle of this year, I found crowds of tertiary cases. The report had gone forth that "mbelegu" was curable at the Mission Hospital, and patients came from three and four days' journey away in numbers such that it was scarcely possible to deal with them. In the course of two years over 2,000 cases had attended. The numbers were far beyond our possible hospital accommodation, so the patients had to bring their own food and camp in the neighbourhood, attending the dispensary as out-patients. Even so a large proportion of them healed rapidly under potassium iodide, though frequently showing crippled limbs as a result of the ulceration,

scarring and contraction that had gone on, perhaps for years, before they came.

As regards the symptomatology of tertiary yaws, I do not know that I can add much to the description of the disease as given by Castellani and Chalmers, or in my own paper written in 1908 [7]. The onset may occur within a year of the healing of the yaws rash, indeed occasionally there is no distinct interval, and the yaws passes on into a chronic superficial skin ulceration. More often there is an interval of apparent complete cure for five or ten years, and perhaps during this time the whole body is clear of rash, but there is the persistence of that chronic condition of the soles of the feet known as "foot yaws" (mitembo).

The nodes have a special tendency to be on the ulna near the elbow and wrist, and often cause deformities of these joints. In children overgrowth or stunting of the radius or ulna occur with consequent dislocation of the hand. The tibia is also a very common situation for nodes. The ribs, sternum and cranial bones are less commonly affected. There is often synovitis of the knees or ankles. Ulceration is either superficial and serpiginous, or deeper, with subcutaneous gummata; or both conditions may be combined.

Left untreated in a native community primary yaws does heal in about a year, but tertiary yaws often steadily advances, causing appalling deformities. It is noticeable that even when untreated some cases do recover, but more often the ulceration spreads at one part and heals at another, causing contractions and dislocations, or strangulation of the blood supply, followed by œdematous swelling of peripheral parts. Generally speaking the effect of ordinary antiseptic treatment of the ulcers and internal administration of potassium iodide is very successful; more so, of course, if the case is seen early before permanent damage has been done.

Once healed, many cases apparently remain cured, others show a tendency to relapse as soon as potassium iodide is omitted. Such patients often put off coming back to the hospital until the disease has again got a serious hold on them.

In a small number of cases, not I think over 1 per cent., potassium iodide seems to have no effect at all. The ulceration may heal at one side, but it continues to spread at the other. I treated one such case for seven years, and eventually a permanent cure resulted. More often the patients lose heart, and go off in search of charms, or new native remedies. Recent papers describe brilliant results from the use of salvarsan even in these obstinate cases [6], and my own recent experience in one such case points in the same direction, though it is too early as yet to speak with any certainty of permanent cure.

Foot yaws is easily cured by soaking the feet till they are soft, and then cutting away all the thickened overhanging edge of skin with sharp scissors, leaving a flat granulating surface at the bottom of the conical hole which has been cut in the thick skin of the sole. The relief to pain is very great and similar to that which follows cutting a corn, the pressure of the surrounding edges of skin being taken off the tender granulation. Generally after this treatment the ulcer heals in a few days.

As regards the prophylaxis of tertiary yaws, doubtless the hope of the future lies in the establishment of special yaws hospitals, and the treatment of all cases with salvarsan, but in view of the widespread nature of the infection, and the uncivilized character of the inhabitants of this part of Africa, that will be a very difficult and expensive undertaking. Moreover, we do not yet know whether a single salvarsan injection, which causes rapid disappearance of the early symptoms, will protect against tertiary yaws, or whether the injections will have to be repeated and checked by frequent tests of the Wassermann reaction, as is recommended in the case of syphilis.

I have no data from which I could attempt to estimate what percentage of those natives who have suffered from untreated primary yaws develop tertiary symptoms later.

Lastly, mention must be made of two conditions, the relationship of which to tertiary yaws is still under dispute, viz., "gangosa" or "rhinopharyngitis mutilans," and the form of leucoderma called melung by Castellani.

From my own experience I am strongly of opinion that both these diseases stand in a close ætiological relationship to tertiary yaws.

As regards rhinopharyngitis mutilans, I have seen about one hundred cases of this disease; all of them have been in parts of the country where tertiary yaws occurred; nearly all of them have given a history of having suffered from yaws, and a good number have presented other tertiary symptoms in the form of nodes, or ulcerations, or scars of healed ulcers. Little can be added to the description given by Leys and others [8]. The disease may begin either in the palate or the mucous membrane of the nose, especially that covering the septum nasi. Only rarely is the skin of the face in the neighbourhood of the nares involved at the same time. The destructive process is chronic, and not infrequently it ceases and heals even in untreated cases, it may be after causing a perforation of the septum nasi or hard palate, or the loss of the uvula. Thus a number of cases with such healed perforations have presented themselves on account of other tertiary lesions elsewhere. Under treatment with potassium iodide and local antiseptics the ulcerative process is generally arrested, but frequently extreme destruction has occurred before treatment is applied for.

It is possible that some cases of gangosa may be due to a specific germ, as suggested in the Philippines, but it seems certain that many cases of this condition are associated with and are a complication of tertiary yaws.

In Castellani and Chalmers' Manual [3], under the name of Melung or Beta, mention is made of a special form of leucoderma which affects the palms or soles or both. The loss of pigmentation is very irregular in distribution and white or yellow areas are intermingled with patches of normal dark skin. There is no loss of sensation; once developed the

disease lasts throughout life. It is said to have been first described by Ziemann as occurring on the West Coast of Africa. I have come across a disease exactly answering to this description, except that the backs of the hands and the dorsum of the feet may be attacked as well as the palms and soles. Among the natives of the Bondé country it is generally recognized that this condition of the hands and feet is a sequela which may follow an attack of yaws, though it may be many years before it develops. The disease is fairly common in German East Africa, and certainly a fair number of the tertiary cases which present themselves for treatment show this symptom. I have made a point of inquiring about a history of a previous attack of yaws in all patients presenting this symptom, and almost always a positive answer is given, and, as above stated, the natives themselves refer to it as a late result of an attack of yaws.

Conclusions.

Tertiary yaws is an important, destructive, and widely spread disease occurring in patients who have suffered from primary yaws. Many of its manifestations are practically indistinguishable from those of tertiary syphilis. Hence when yaws is known to occur in a community great care must be taken to eliminate its tertiary symptoms before pronouncing tertiary syphilis to be widely spread.

Rhinopharyngitis mutilans and a special form of leucoderma of the palms and soles are in many instances symptoms of tertiary yaws.

References.

[1] Boissière. "Some Observations on Yaws," Journal of Tropical Medicine and Hygiene, vol. vi, p. 372. "Filaria and Yaws in Fiji," *ibid.*, vol. vii, p. 179.

[2] Castellani and Chalmers. "Manual of Tropical Medicine," First Edition, p. 870. See also a paper on "Tertiary Yaws in Fiji," Montague, Journal of Tropical Medicine and Hygiene, vol. xiii, p. 161.

[3] *Idem.* "Manual of Tropical Medicine," p. 144.

[4] Fincicane. "On Yaws as Observed in Fiji," Journal of Tropical Medicine and Hygiene, vol. iv, p. 129.

[5] *Vide* German Colonial Medical Reports for 1910-11. Review in the *Tropical Diseases Bulletin*, vol. iii, p. 177. It is stated with regard to German East Africa that in some parts 50 per cent. of the native inhabitants are syphilitic.

[6] Girling. "Treatment of Yaws and their Sequelæ by Salvarsan," Journal of Tropical Medicine and Hygiene, vol. xvii, p. 193.

[7] Howard, R. "Tertiary Yaws," Journal of Tropical Medicine and Hygiene, vol. xi, p. 198.

[8] Leys. "Rhinopharyngitis Mutilans," Journal of Tropical Medicine and Hygiene, vol. ix, p. 47.

[9] Numa Rat. "A Paper on Yaws," Journal of Tropical Medicine and Hygiene, vol. v, p. 209.

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THE JOURNAL OF

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FEBRUARY 1, 1915.

ÆTIOLOGICAL FACTORS IN THE DISTRIBUTION OF PLANTS.

The part played by man in the distribution of plant life becomes more and more apparent as time passes and the means of intercommunication increases. The reason for the introduction of this and that plant into fresh countries is wholly economic, whether viewed from the point of view of food for man and beast, or for medicinal purposes. The actual place or places in which any plant or cereal was first met with on the earth must be, as regards precise historic fact, more or less of the nature of a myth and fable. From what we see accruing in our time many plants

have found fresh habitats, where they have flourished for a period, and then, for some economic reason, the cultivation ceases and they are known no more in that region. The indigenous origin of any specimen of vegetable life is mere conjecture. Even when civilization is left and "unknown" regions are explored, that the plant life is of primeval origin is mere assumption; for areas now classed as "unknown" or unexplored may have been, and in many instances are now known to have been, in the high road of human intercourse. Even in "darkest Africa" inroads of men, now from the north, now from the south and all points of the compass, pushed their way in search of treasure or food, or were carried into fresh countries through the burning enthusiasm of religious fanatics ever anxious to spread their power and sway.

Beginning with one of the most important of all changes in plant life on a large scale, namely cotton, we find a condition of things which well illustrates how plants become distributed. India, as far as is known, was the first country to grow and use cotton to a large extent, and had developed a system of manufacturing and dyeing cotton goods some five hundred years before the Christian era. Yet the growing of cotton has become a feature of the economic life of the United States of America. The cotton plant has been met with in many countries possessing a warm climate, ranging from Fiji in the Old World, to Peru in the Western Hemisphere. To such an extent had this developed that at the exhibition held in London in 1862 no fewer than thirty-five countries sent specimens of their cotton. The stimulus to countries outside the United States to cultivate the plant was due to the existence of the great Civil War in the States which in five years reduced the exportation of American cotton to a minimum. For the first time in history, however, the plant has been grown in Africa and in the countries bordering on the Gulf of Guinea. Successful cotton growing is now a feature of the "West Coast" industries.

The cotton plant is not, so far as is known, a native of the United States of America, but it was brought thence from Barbados, Honduras or Mexico. It was found that the moist climate of the low-lying islands off the Georgian coast was particularly favourable to the growth of cotton, and hence the name "sea-island" cotton bestowed upon this superlative variety of the plant. It may here be remarked also that the migration of this plant to lands where previously it was unknown was also the cause of a notable migration of a section of mankind, being no other than the introduction of the African negro to the Western Hemisphere, where his presence was necessary for the work in the cotton fields. This again was responsible for the greatest civil war of all time, for the negro was brought in as a slave, and it was to break the thraldom of slavery that the memorable outbreak occurred. The introduction and cultivation of a mere plant was thus the cause of one of the greatest civil convulsions in history. Another plant, opium, is held responsible for the British wars with China, and only recently the international relations between China and Britain have been strained to well-nigh breaking point over Indian-grown opium and its usage.

The tea plant again led to a two hundred year contention and fight with the Chinese authorities, for it was the desire to obtain tea (and also silk) that brought the British traders to the China seas, and it was owing to the difficulties and obstruction to trading with the Chinese that was responsible for the introduction of the *Thea sinensis* (Linn.) to Ceylon, Assam and elsewhere in the Indian Empire. The coffee plant, originally known in Abyssinia, was brought by the Arabs to the Yemen district of South Arabia, and under the name of Mocha coffee became celebrated. From Arabia the plant was brought to Java, and thence through Holland to the West Indies and Brazil. An example of a plant industry being introduced and then disappearing is afforded by Ceylon, where coffee was introduced, cultivated to a high pitch, and finally became well-nigh extinct owing to disease appearing in the plantations.

Cinchona also affords an example of the part played by man in the translation of plant life to countries far distant from the indigenous centre. Originally discovered in the mountainous districts of Peru, the plant was introduced into countries as wide apart as Algeria, Java, Southern India, and Ceylon. In the latter country the industry was extensive, but it has flagged of late years, and threatens to be altogether neglected.

India-rubber, a plant indigenous to South America, has found its way to Africa, Ceylon, the Straits Settlements, and the Dutch East Indies; and it is in countries where the plant is an exotic that the chief industry in rubber is now concentrated.

The above examples deal with only recent transportations of plant life the products of which have become of great economic value; but were one to go into other and more antiquated examples, such as wheat, barley, oats, rice, and vegetables such as cabbage, cauliflower, potatoes and the majority in fact of our vegetable foods, it would be found that the spread of plants has been due in a small degree only to Nature's efforts, but has been brought about by man, and that the majority of mankind are at the present day living on foods which are the products of exotics and not natural to the soil of the countries in which they are now found; in fact that mankind lives for the most part on food which is foreign to the soil in which he dwells. It is an interesting theme, and its effect on man and his development is perhaps due more largely to the influence of the spread of plants from one sphere to another than any other known factor. That it has been the cause of many wars, of exploits, of expeditions and political intrigues, is undoubted, and that it has been the cause also of the transference of many parasites of plant life from one country to another is a phase of the question fraught with the deepest interest.

Even the desire to obtain possession of countries rich in minerals, such as coal, gold, silver, copper, and precious stones, is quite a secondary factor in political history to the part played by plant life in modern economic warfare.

Annotations.

Leprosy: Its Treatment by Hypodermic Use of Chaulmoogra Oil.—V. G. Heiser (*Amer. Journ. of Tropical Diseases and Preventive Medicine*, November 11, No. 5, pp. 295-355) uses chaulmoogra oil and camphorated oil, 60 c.c. each; resorcin, 4 grm. Mix and dissolve with the aid of heat on a water bath and then filter. The injections were made at weekly intervals. The initial dose is 1 c.c., and this is increased to the point of tolerance. The object sought is so to regulate the dose as to prevent reactions of too violent a character. This treatment gives more consistently favourable results than any other, and it holds out the hope that further improvement may be brought about. It produces apparent cures in some cases, causes great improvement in many others, and arrests the progress of the disease in almost every instance. Over twenty patients have become microscopically negative since they began the treatment. The treatment is apparently equally efficacious in all forms of the disease, the tubercular or hypertrophic, the anæsthetic and the mixed.

Bacteriemic Nature and Laboratory Diagnosis of Lepra.—That *B. lepra* exists in the circulating blood, Rivas and Smith (*Amer. Journ. Tropical Diseases and Preventive Medicine*, ii, No. 5) have the following evidence: (1) *B. lepra* is found in the blood collected from healthy parts of the skin which are apparently normal and from which the micro-organisms are usually absent on section. (2) By the acetic acid method *B. lepra*, either singly, in pairs, in masses, or in bundles, is detected in the venous blood. (3) The presence of *B. lepra* in the form of lepra cells or phagocytosed by endothelial cells, and more especially by lymphocytes in the venous blood. And, finally, they suggest that the apparent or actual growth (at least temporarily) of *B. lepra* in cultures made from the venous blood may be an indication of the resemblance of leprosy to other bacteriemic diseases.

Gaseous Gangrene and Phlegmons.—E. Fraenkel and K. Franke (*Münch. med. Wochen.*, November 10, lxi, No. 45, pp. 2197-2232) say that when there is no secondary infection the gaseous gangrene is not accompanied by suppuration. It is, in fact, a malignant emphysema. It can be differentiated from malignant œdema in twelve or eighteen hours by inoculation of animals, the guinea-pig for gas-gangrene, the rabbit for malignant œdema, the rabbit being apparently completely refractory to the germ of gas-gangrene. Staining a smear with a diluted solution of carbol-fuchsin will show the gas bacillus with its rounded ends, instead of the bevelled ends of the anthrax bacillus, and its short thick shape distinguishes it from the slender bacillus of malignant œdema. The bacillus of gas-gangrene is strictly anaerobic, and consequently treatment must aim to admit air freely to check its growth. Ample incisions and playing a jet of oxygen on the tissues, with extensive use of hydrogen peroxide, are the main reliance. If these fail, amputation may save the rest of the body. No serotherapy or internal measures have yet proved of use, but the patient's strength must be kept up.

In the six cases described of gaseous phlegmon it developed several days after shell wounds in the leg. The onset was sudden, the limb became painful and discoloured, the symptoms and aspect resembling those of acute and rapidly progressing venous thrombosis except for the accumulating gas. The zone of demarcation was more painful on pressure than the peripheral region. Amputation was the only recourse in four cases, and was successful in two. In the two others the trunk was already involved, and the patients seemed doomed, but one was saved by exarticulation of the thigh; the emphysema in abdomen and chest then promptly subsided. The other patient was febrile and did not survive the operation.

Treatment of Tetanus.—V. Czerny (*Deutsche med. Wochen.*, Berlin, xl, Nos. 44 and 45, pp. 1905-1928) states that half of all the wounds that come under his hands were the jagged tears made by shrapnel, and that tetanus threatens to decimate these wounded. There were twenty-nine cases at Heidelberg alone up to the end of September. The fine hospital trains are unable to care for even a tenth of the wounded in the present gigantic battles. The wounded have to be taken to the rear in freight trains that have brought horses and other supplies to the Front. There is no time to clean them properly, but if two or three empty cars are attached, these can be cleaned and the wounded then transferred to the cleaned cars on the trip. By such care during the transportation it may be possible to ward off tetanus. In September he had four cases of tetanus that had developed on the way, although the journey lasted only two days, and now the distance to be covered sometimes requires an eight-day journey.

In treatment he suggests that as the tetanus toxin is destroyed by heat, it might be possible to sterilize the wound with superheated air of diathermia. Iodoform and Peruvian balsam, he says, might likewise check the growth of the bacteria. He thinks that primary amputation should not be rejected so absolutely as is the rule now. Two of his tetanus patients recovered after amputation. A third died without the contemplated amputation, and necropsy revealed that the limb had been shattered much more seriously than its aspect revealed. All wounds should be given preventive antitetanus serum treatment when tetanus is prevailing; he had a patient once who died of acute trismus the sixth day after he had scratched his nose on the thorn of a rose. The wounded should be protected against jars, draughts, and nervous shocks. A preventive injection of antitetanus serum should be given the same day as the injury, especially if it is a shell wound. Local muscular spasm in the vicinity of the wound is often the first sign of trouble.

Abstracts.

ON THE OCCURRENCE AND PATHOLOGY OF ENDEMIC GLANDULAR FEVER, A SPECIFIC FEVER, OCCURRING IN THE MOSSMAN DISTRICT OF NORTH QUEENSLAND.[1]

By A. Breinl, H. Priestley, and J. W. Fielding.

O. Smithson[2] called attention in 1910 to a specific fever, occurring throughout the Mossman district, situated in North Queensland, which he termed "Mossman fever."

Definition.

Endemic glandular fever is an acute disease, characterized by an irregular remittent fever of from three days' to three weeks' duration, accompanied by painless swelling of certain groups of superficial lymph glands, and by the appearance of a macular, or occasionally vesicular, rash.

History.

The Mossman district was first opened up by Europeans in or about 1877, when timber-getters settled along the Daintree River, which is situated about twelve miles north of the present township of Mossman. Early settlers stated "that shortly after their arrival in the district cases of sickness occurred amongst them, of a continuous fever, lasting for several weeks, accompanied by swellings in the armpits and groin. They observed a similar disease amongst the aboriginal inhabitants" and stated "that this disease existed prior to their advent amongst the aboriginals of the district."

Distribution.

The disease prevails between the coastal range of mountains and the sea, in the Mossman district, within a limited area, extending approximately eighteen miles to the south and thirty miles to the north of the township of Mossman, a town situated at a latitude of 16° S., a few miles inland from Port Douglas. Sporadic cases of the same complaint came from Mount Molloy and Mount Carbine (west of the town of Mossman, over the coastal range), and from Maytown and Bloomfield, near Cooktown.

One man treated at the Townsville Hospital had left the Mossman district nine days prior to the development of definite symptoms.

Symptomatology.

Six days is the latent period between the reception of infection and the onset of symptoms, but for a few days in some cases even as long as eight days preceding the onset of pyrexia the patient suffers from a feeling of malaise, with diminished appetite. In one of the cases observed by us the temperature rose suddenly on the eighth day after his admission to the hospital. The patient was suffering from cane boils, but for two days previously he had complained of headache and loss of appetite. The case treated in the Townsville Hospital developed symptoms nine days after leaving Port Douglas, so that the length of the incubation period may, to a certain extent, vary and may be as long as ten days.

The history does not bring out any distinctive features. The disease begins with a general feeling of malaise, with headaches, loss of appetite, accompanied by dry retching and vomiting. These symptoms become more and more marked as the disease progresses.

The temperature may rise suddenly or gradually, reaching its maximum within a few days, and is of a remittent type. Rigors are seldom observed. The high temperature persists for about ten days, but the time may vary from three days in a mild case to three weeks or more in a severe case. After the period of pyrexia the temperature falls by lysis.

The pulse-rate does not increase proportionately with the temperature. The pulse is soft, of low tension, and often dicrotic. The rate of the respiration is not altered. Headaches, which may be purely frontal or occipital, are always present, and pains in the back of the eyes are common, accompanied by a certain degree of photophobia. The patients complain of pains in the back and limbs, but not to the same extent as in dengue fever. Anorexia is always noticed, and sleeplessness and nervous irritability are marked features.

The Lymphatic System.—An enlargement of certain groups of the superficial lymph glands, in the majority of the cases of the axillary and inguinal, less often of the cervical glands, is invariably present. A slight enlargement is often observed at the time of the onset of the fever, which becomes more marked as the disease progresses, so that during the height of the fever the lymph glands may be as large as a walnut, but do not, as a rule, exceed the size of a marble. They are hard, indolent and often tender on deep pressure, and do not show a tendency to abscess formation. As the fever abates the swollen lymph glands decrease in size rapidly, though a slight enlargement may persist at times for months.

The spleen is not palpable, and the liver is normal in size.

Skin.—All the cases observed by us—only 30 per cent. of Clarke's cases—developed a well-marked rash on the trunk, arms and legs, and occasionally on the face, simultaneously with, or a few days after, the rise of the temperature, persisting for two to four days, and disappearing without any apparent desquamation. It may take the form of copper coloured macules, the slightly raised darker centre being surrounded by an erythematous halo, or may rarely be of vesicular character, closely resembling that of chicken-pox.

The majority of the patients sweat profusely, mostly at night. The tongue is coated with a thick yellowish fur, which at a later stage becomes dark brown. Pains in the throat on swallowing are quite common, due to an hyperæmia of the pharynx. Vomiting of bile-stained fluid often occurs. Most of the patients complain of constipation, but diarrhœa has been observed. The abdomen is not distended, nor is it tender on palpation. The urine does not

[1] Abstracted from the *Medical Journal of Australia*, October 24, 1914.

[2] "Mossman Fever," *Journal of Tropical Medicine*, 1910, xiii, No. 23, p. 351.

show any changes beyond those due to the pyrexia, being concentrated and of dark colour.

The respiratory tract shows no changes other than an occasional slight bronchitis, and the heart is, except in very severe cases, but little affected.

Relapses have been observed. The cases are classified under three headings, namely, the restless, the drowsy, and the chronic type.

The restless type, comprising about 92 per cent., is characterized by a marked nervous irritability, and restlessness, and occasionally twitching of the muscles, by troublesome nightmares and not infrequently by nocturnal delirium.

In the drowsy type, "the symptoms in general resemble those of the restless type, with the following exceptions: After an initial headache, often of distressing severity for a few hours, practically all symptoms of pain cease. The patient becomes drowsy and depressed, and he loses all interest in his surroundings. He is easily aroused to take food or medicine; the perspiration is not so profuse as in the restless type. Although the patient in the early stages takes his food well, he loses weight rapidly. The tongue is very dry, and rapidly becomes coated of a deep brown almost black colour. There are frequent marked twitchings of the voluntary muscles. The superficial lymphatic glands are more enlarged than in the restless type of the disease. Nystagmus may develop late in the complaint. During the second week after the onset of the pyrexia the drowsiness may deepen into coma, and a fatal issue rapidly ensue. A sudden fall to sub-normal, followed by a rapid rise of the temperature to 103° F. or even higher, may take place towards the termination of the disease.

In general, the appearance of the patient resembles one with typhoid fever, but there is no distension or tenderness of the abdomen. The characteristic typhoid rash does not develop, the spleen is not enlarged, tympanites, perforation, and hæmorrhage do not occur. In fifty-three cases of the drowsy type, eight of the patients had previously suffered from typhoid fever.

The chronic type, on the whole, resembles a mild restless type. In these cases the temperature may rise from a little above normal or even sub-normal in the morning to 99° F. or 101° F. in the evening. The lymph glands are only slightly enlarged, a feeling of malaise is well marked. These symptoms may persist for three or more months.

One attack of the disease confers a slight and transient immunity only, and the same person may contract the infection at yearly intervals.

Prognosis.

The prognosis is, generally speaking, very favourable; amongst 1,482 cases there was a mortality of less than 1 per cent.

Diagnosis.

When a case of endemic glandular fever occurs within the endemic area the diagnosis does not present any difficulties to the experienced; but since this fever resembles in some of its clinical aspects certain other diseases, the differential diagnosis must be discussed.

Many of the cases of dengue occurring in Queensland show a more or less pronounced swelling of the superficial lymph glands, and the rash in dengue fever simulates, in many instances, that of endemic glandular fever. The course of the fever, however, differs. In typical cases of dengue, the pyrexia lasts for five days only, being followed after a remission of about two days by a short relapse, whereas in this fever a fairly high remittent temperature persists, usually for ten days or more. The pains in the back, the bones and the joints, so well known in dengue, are but little marked. The pulse, rapid in the former and increasing proportionately with the temperature, is only slightly raised in endemic glandular fever. Besides, in dengue, the incubation period is shorter, the onset more rapid, and the convalescence extends over a longer period.

Endemic glandular fever was at one time considered to be bubonic plague. The differential diagnosis should not present any difficulties, since the swollen lymph glands in the latter are not symmetrically distributed; they are painful and tender and are prone to suppurate, though the course of the fever is similar in both.

On the whole, the clinical picture of the majority of cases of endemic glandular fever is not of the same severity as that of bubonic plague, and the anxious facial expression, so typical in the latter, is entirely absent. An isolated case of the fever outside the endemic area might be mistaken for bubonic plague, especially since the first cases of an epidemic are comparatively mild, but a bacteriological examination will decide the diagnosis.

In climatic bubo, a disease which occurs in North Queensland, and might be confused with endemic glandular fever, only the lymph glands of the groin become swollen and painful, and frequently suppurate, and the severe constitutional disturbances are invariably absent.

Endemic glandular fever has been termed, for an unknown reason, filarial fever, though there is no clinical resemblance between the two.

Etiology.

The etiology of endemic glandular fever is unknown. A great number of smears of the peripheral blood and of lymph gland juice obtained by gland puncture from patients stained by Giemsa's stain and by Breinl's wet methods were examined with entirely negative results.

Blood cultures were made from a number of cases of ordinary culture media, including serum, but were entirely negative in every case. The cultures made from the urine of one case showed no growth beyond a few colonies of *Staphylococcus albus*.

Pathology.

The blood of a number of patients was carefully examined, and it was found that the number of red blood corpuscles and the amount of hæmoglobin do not undergo any changes during the course of the disease.

The number of white blood corpuscles increases during the first few days, but a pronounced leucocytosis was not observed in any of our cases. The differential count showed an increase in the percentage of lymphocytes only (see Table I).

TABLE I.

Date of disease	R.B.C.	W.B.C.	Differential count				
			Polymorphs, neutrophiles	Transitionals	Lymphocytes	Eosinophiles	Large monocular
Case W.			%	%	%	%	%
2nd	4,630,400	6,900	71·8	0·6	25·6	—	2·0
7th	—	12,300	55·2	0·4	43·0	—	1·4
Case M.							
About 7th day	4,876,800	9,200	77·2	1 0	19·0	—	2·8
12th	—	11,766	53·4	0·4	44·6	0·2	1·4

Histology of Lymph Glands.—Lymph glands from the groin and neck of one of the fever cases were extirpated. On cross section they appeared hyperæmic, of light pinkish colour, soft and œdematous. There were no necrotic areas noticeable.

The histological examination of sections stained by various methods showed the typical picture of an acute lymphadenitis. There was œdema and small-celled infiltration in the periglandular tissue. The blood-vessels of the lymph glands were distended, and free red blood corpuscles were scattered in between the glandular tissue. The lymphoid tissue was permeated by distended lymph spaces, containing a few blood corpuscles and endothelial cells, some of them in varying stages of degeneration, the chromatin showing fragmentation. Many of the endothelial cells contained cell *débris*; no necrotic areas were seen.

ANIMAL EXPERIMENTS.

Two monkeys (one *Macacus rhesus* and one *Cercopithecus* (?)) and one guinea-pig, were injected with about 10 c.c. of the peripheral blood of two patients, who showed well-developed symptoms of endemic glandular fever. In these monkeys a definite rise in temperature was observed on the ninth and tenth day respectively, after inoculation.

Since the temperature of both monkeys rose after the same interval it is evident that the fever was due to an infection from the blood of the patient. The body temperature previous to inoculation was fairly constant, and fell, in one case five days, in the other four days after the onset of the pyrexia to the normal; two control monkeys kept under the same conditions did not show any rise in temperature. The conclusion is therefore justified that the inoculation of blood from cases of endemic glandular fever into monkeys had given rise to a pyrexia, due to the causal agent of endemic glandular fever.

The lymph glands of the infected monkeys became slightly enlarged at the time of the onset of the pyrexia.

The guinea-pigs did not react to the inoculation in any definite way.

EPIDEMIOLOGY.

Persons of both sexes and of all ages are susceptible to endemic glandular fever. A racial immunity does not exist; Australian aborigines, natives of the Pacific Islands, and Asiatics are known to have contracted the disease. It seems that the old inhabitants of endemic districts contract the fever as well as newcomers, perhaps in a milder degree. A comparison of the number of cases of this fever which underwent treatment at the Port Douglas Hospital during the last few years, with the average maximum and minimum temperatures, and the monthly rainfall, makes it apparent that the air temperature, as such, and the amount of rainfall do not influence its incidence, and that there is no marked seasonal variation noticeable.

It is interesting to note that the number of cases admitted per month before April, 1911, was much higher than in the succeeding years (see Table II). At the end of March, 1911, the district was visited by a cyclone, followed by a very heavy flood. The figures seem to indicate that there may be a causal connection between the occurrence of the flood and the diminution in the number of cases.

The hospital records prove further that the incidence of the fever is not evenly distributed over the district, but that the greatest number of cases had come from certain well-defined localities, as a rule situated near to dense scrub country, although sporadic cases occurred throughout the whole district.

TABLE II.—NUMBER OF CASES OF ENDEMIC GLANDULAR FEVER ADMITTED TO THE PORT DOUGLAS HOSPITAL.

Month	1908	1909	1910	1911	1912	1913	1914
January ..	—	5	11	15	4	4	2
February ..	—	8	20	15	8	6	6
March ..	—	9	15	20	9	6	5
April ..	—	9	12	5	1	4	4
May	—	7	18	3	5	8	8
June ..	18	5	13	2	6	10	4
July	21	15	25	4	4	12	6
August ..	25	31	21	4	9	6	—
September ..	24	38	10	—	2	12	—
October ..	17	21	17	1	7	3	—
November ..	3	2	14	8	9	4	—
December ..	1	2	12	7	5	3	—
Total ..	109	152	188	84	69	73	35

It was pointed out to us that farm hands employed in the cane fields, and farmers who were compelled to do manual work in the field, were more prone to contract the disease than supervising farmers, and that the number of women and children admitted to the hospital suffering from the fever formed a small percentage only of the total number of cases. During the six years for which records were obtainable only forty-three women were admitted out of a total of 715 cases.

Since cases of endemic glandular fever have been observed in districts where no sugar-cane is cultivated,

it is clear that the incidence of the disease does not depend solely upon local conditions brought about by the cultivation of sugar cane. All cases observed in other localities were, however, men who had spent some time previously in the dense scrub.

Nothing definite is known about the ways and means by which the disease spreads. There is no doubt that it cannot be considered a contagious disease, since no case has ever originated amongst the staff of the Port Douglas Hospital, and no in-patient of this institution has contracted the disease whilst in the hospital, although no special precautions are taken to prevent the possible spread.

Water and food as sources of the infection can be eliminated by the consideration of the localized distribution. The local occurrence and spread of the fever, the incidence of the infection in proximity to scrub country, and, furthermore, the fact that it is mostly cane cutters and field workers sleeping in camps, situated in sheltered places near water, who contract the fever, whilst the greater number of supervising farmers, who spend only the day or part of the day in the field, escape infection, indicates that endemic glandular fever is, in analogy with dengue, malaria, &c., an insect-transmitted disease.

Conclusions.

(1) Endemic glandular fever is a specific disease occurring in the Mossman district of North Queensland, characterized by a high remittent temperature of about ten days duration, enlargement of certain groups of the superficial lymph glands, and the appearance of a rash.

(2) The etiology of the fever is unknown, no parasites were discovered in the peripheral blood and gland juice, and cultural examination of blood and urine gave negative results.

(3) Histological examination of enlarged lymph glands showed the typical picture of lymphadenitis.

(4) Two monkeys were successfully infected by means of blood inoculation from two patients.

(5) Epidemic glandular fever is in all probability an insect-transmitted disease.

AN UNUSUAL CASE OF SCREW-WORMS IN THE NOSE AND NASAL ACCESSORY SINUSES.[1]

By George U. Huber, M.D., and Frank L. Flack, M.D.

J. M., farmer, aged 66, was referred to us October 5, 1914, for hæmorrhage of the nose. This patient had had trouble with his nose for several years. One year ago last August his nose began to discharge and became very sore. At varying intervals large masses of necrotic material were discharged from his nose. Following this he was relieved. Up until two weeks ago his condition had remained about the same. At this time a fly went in one nostril and came out of the other. Following this trouble he became rapidly worse. October 2, he felt something moving in his nose and called a doctor, who saw him several times and gave him treatment. This was of but little benefit. Finally the doctor injected chloroform and removed seventy-two Texas screw-worms. The patient's condition remained serious, and he was brought to the hospital for treatment. At this time a Wassermann test was made, which was strongly positive.

Under general anæsthesia the following conditions were discovered: The walls of the right antrum of Highmore were completely necrosed and the antrum filled with worms. The middle turbinate on the right side was markedly necrosed. The right frontal sinus was open, and the right ethmoidal cells exposed. The walls of the antrum on the left side were partly necrosed. The turbinate on this side was partly necrosed and the ethmoidal cells exposed. The right eye was swollen, shut, and a worm was found in the lachrymal sac. These worms were the ordinary Texas screw-worms, measuring about 1 in. in length and about $\frac{1}{8}$ in. in diameter. Forty were removed at operation. On the right antrum a Cadwell-Luc operation was performed. On the left antrum a Denker operation was done. The Ballenger turbino-ethmoidectomy was performed on both sides. The right frontal sinus was curetted. The right canaliculus was split and the lachrymal duct probed. All sinuses were packed with iodoform gauze, after a thorough irrigation with a 10 per cent. solution of chloroform.

The after-treatment consisted in blowing iodoform into the nose and sinuses for one week and a vigorous course of antisyphilitic treatment. After a week the man was in a much improved condition and left the hospital.

This patient had a long-standing specific necrosis of the bones of the nose and accessory sinuses which undoubtedly attracted the fly carrying the larvæ and furnished favourable conditions for their growth and reproduction.

October 27, 1914, the patient was cured of the worms, and the nose looks perfectly healthy except for the damage done by the specific necrosis previously.

[1] Abstracted from the *Journal of the American Medical Association*, December 26, 1914.

OIDIOMYCOSIS IN PORTO RICO.[1]

By E. R. Hildreth, M.D., and A. C. Sutton.

While about 150 cases of oidiomycosis have been recorded, this is the first case noted in Porto Rico. The diagnosis was made from an examination of fresh specimens of pus in 10 per cent. sodium hydroxide solution, and of stained smears. The pus, which was rather whitish, contained numerous doubly-contoured, oval and spherical bodies, frequently budding, and in the sodium hydroxide solution highly refractive. They varied from 10 to 15 microns in diameter. Besides there were many smaller spherical bodies about 3 microns in diameter.

[1] Abstracted from the *Journal of the American Medical Association*, December 26, 1914.

History.—Mr. D. A., aged 40, a native of San Juan, Porto Rico, who had never been off the island, was first seen in our clinic at the Presbyterian Hospital, San Juan, July 22, 1914. He complained of painful lumps on his legs, and also cough and pain in his chest. Statements regarding any family history were unreliable.

Present Illness.—The first nodule appeared about the middle of May, on the outer part of the left leg, about 4 in. below the knee. About one month later two more appeared, one on the front of each thigh about 3 in. above the knee. Two weeks later two more came out; one on each leg 3 in. above the last ones. They began as small, hard lumps under the skin, and became steadily larger until about 1 in. in diameter, when they softened in the centre. They were always extremely painful from the start. The patient had had attacks of pain in his chest every two or three months for the past two or three years, accompanied by a cough with a slight amount of tenacious phlegm.

Physical Examination.—The oldest nodule was 1½ in. in diameter. The centre showed distinct fluctuation. The outer edge was very hard and the surrounding tissues were somewhat infiltrated. The skin over all of them was a deep purple. The lesion just above the largest one had likewise begun to soften. The others were simply hard, painful, subcutaneous nodules. The inguinal glands on both sides were distinctly palpable.

There were no marked physical signs in the chest. There was, however, slight dulness at the left base, accompanied by a louder respiration and more prolonged and higher pitched expiration than at the right base. The sputum was never examined because the expectoration ceased before the second visit.

Treatment.—The nodules which showed fluctuation were incised and drained with iodoform gauze. By the next visit they had become deep, punched-out ulcers, which were then kept on a wet mercuric chloride dressing. Ichthyol ointment was used to rub on the other nodules. The patient was given potassium iodide internally 10 drops three times a day, increasing 1 drop each dose to 20 drops of a solution of 50 grm. of potassium iodide in 50 c.c. of water.

The patient showed steady improvement. The symptoms in the chest disappeared. The nodules on the legs became smaller and smaller. All the pain disappeared. When last seen, a month and a half after the first visit, he seemed fully recovered.

LATENT ATYPICAL MALARIA COMPLICATING THE PUERPERIUM.[1]

By M. J. Seifert, M.D.

This is a case of latent atypical malaria complicating the puerperium in a patient afflicted with chronic nephritis of long standing.

Mrs. X., aged 25, American, lived in Illinois all her life. When 2 years old she had a severe attack of "summer complaint." Puberty at 12 years was uneventful so far as the establishing of normal menstruation was concerned, but the patient was ill four weeks at that time as the result of a fall on her head while attending school. At 15 years the patient became anæmic, which condition persisted to the age of 18, when she was unable to walk for one month on account of dropsy.

June 20, 1900, at the age of 20, the patient was married. May 9, 1901, aged 21, she was confined and delivered of a fine healthy boy weighing about 10 lb. On the sixth day after labour she had chills and fever, which at that time were attributed to a probable infection, as there was no trained nurse in attendance. There were no manifestations of puerperal sepsis, no pelvic symptoms, no offensive lochia, and no stitch infection. The perineal lacerations were bilateral, though not extensive; the cervix sustained slight tears on both sides. Unfortunately, no clinical record could be made of this sickness, which lasted about three weeks. The treatment was not anti-malarial, but tonic and supportive—entirely symptomatic. The patient made an uneventful recovery and, to use her own expression, "enjoyed better health than ever before in all my life." This state of good health lasted until her next pregnancy. February 22, 1905, aged 25, at 4.15 a.m., patient gave birth to a 12-lb. boy in St. Mary of Nazareth Hospital, Chicago. There were extensive lacerations of the cervix uteri and of the perineum and more than ordinary hæmorrhages. The latter caused three fainting spells. No vaginal examinations were made as there were no indications of any pathologic conditions, and, besides, there was no time for ascertaining details between the time of her admission, late in the evening of February 21, to the time of the spontaneous labour, 4.15 a.m., February 22. As persistent uterine inertia followed, the placenta was delivered artificially. This caused a fourth fainting spell. The patient was allowed a brief respite, until 8.15 a.m., when the cervical and perineal lacerations were repaired, using only a few whiffs of an anæsthetic. A fifth fainting spell occurred in the operating-room after the completion of the suturing. During the night the temperature rose to 100° F., and the pulse to 120, but both were normal the next morning. Every function was normal with the exception of the pulse, which ranged from 90 to 100 and above —in fact, the pulse was often above 100. Owing to the nervousness of the patient and the absence of any discoverable disease other than chronic nephritis with its usual concomitants, no unusual significance was attached to this feature of the case, especially since the pulse was otherwise normal.

February 28 the left breast became indurated and painful, and the patient had slight chills and complained of nausea. At 6 a.m. the temperature rose to 102·6° F. and the pulse to 105. The breast was massaged and boric acid fomentations and breast pump were applied. The nipple, being fissured, was treated with glycerine and tannic acid.

[1] Abstracted from the *Journal of the American Medical Association*, December 19, 1914.

Enemata and sponge baths were given for eliminative and antipyretic purposes. I thought the difficulty was overcome. Urinalysis showed specific gravity 1032; 4 per cent. albumin by volume; trace of sugar; some hyalin and a few granular casts.

On March 1, 2, and 3 the temperature was 104° F.

In spite of finding no pathologic lesions of any kind there was no improvement in the pulse-temperature wave, which rose to 140 and 106·8° F., and never dropped below 110 and 101° F., respectively. There was not even the slightest periodicity in these records. A careful study of the case, course, examinations made and treatment given, revealed the fact that malaria was about the only disease not thought of. While the clinical record did not support any malarial theory, yet on a blood examination parasites of the tertian variety were found.

Specific anti-malarial treatment (quinine bisulphate 2 gr., followed by a cup of hot water every two hours), produced good results in twenty-four hours. In forty-eight hours convalescence was established, and recovery was gradual and positive. No other untoward symptoms appeared, excepting cinchonism, which was overcome by adding sodium bromide 5 gr. to each dose of quinine.

After all symptoms subsided, the patient normal in every respect and ready to be discharged, she complained of slight tenderness in the pelvis. Some lochial discharges appeared March 21, 1905, which, on microscopic examination, were found to contain gonococci. The husband admitted to consultant and to me that he had been afflicted with gonorrhœa.

SUMMARY.

The patient never lived in a strictly malarial locality. The symptoms were not at all typical of malaria. The patient never had an attack of malaria until after labour. The anæmia that occurred between the ages of 15 and 18 might have been the result of malarial intoxication (in latent form). The occurrence of irregular chills and fever in two consecutive confinements and never at any other time, with no pelvic involvement and with positive microscopic findings in the second, merits attention. The late gonorrhœal complications after the second puerperium about thirty days after labour and long after other conditions were normal, was an extraordinary experience. Every case of fever following labour is not puerperal sepsis.

Finally, the most important part of this paper is the lesson to be learned from a lack of thoroughness in diagnosis. There was an acute exacerbation of nephritis engrafted on a chronic nephritis of long standing, together with acute mammitis and the atypical malarial manifestations, to say nothing of the late gonorrhœal infection, all of which formed a symptom-complex so confusing and so perplexing that it was indeed not easy nor yet hardly reasonable to expect to decipher such symptoms as would make for a diagnosis of malaria.

Literary Intelligence.

NEW editions of several popular works of reference dealing with the British Pharmacopœia, 1914, are already announced as in the Press, or the publication is anticipated at an early date.

Squire's Pocket Companion to the British Pharmacopœia, 1914.—This book will contain about 1,100 pages, but owing to the adoption of a specially thin paper the actual size of the book will be smaller than the first edition of the Pocket Companion. It is a handsome volume bound in red leather, and gold lettered, and contains a complete account of the alterations and additions to the British Pharmacopœa, 1914. It deals very fully with those items which are essential to both the prescriber and the dispenser. The Prescribing Notes which are the particular feature are the personal experience of the author of over forty years in the dispensing of physician's prescriptions. This is a feature which will be particularly appreciated by the medical profession. Owing in the first place to the clear distinction in type, and secondly to the carefully compiled lists of Official and Not Official preparations, it is possible for the prescriber to ascertain immediately whether a particular preparation which he desires to prescribe is Official or Not Official. The medical references to treatment are very complete, and are thoroughly up-to-date. The chapter on therapeutic agents of bacterial origin has been revised and almost entirely re-written by Professor R. Tanner Hewlett, Professor of Bacteriology in the University of London. It will contain the latest and most up-to-date information on antidiphtherial and antitetanic serums, tuberculins, vaccines, &c. The book will be published at 10s. 6d. net. Publishers, J. and A. Churchill, 7, Great Marlborough Street, London, W.

Nineteenth Edition of Squire's Companion to the British Pharmacopœia, 1914, will be issued later in the year. This volume deals with a much wider field, and in addition to being a critical review of the British Pharmacopœia, also compares its preparations with those of the French, German and United States Pharmacopœias. In this work considerable attention is paid to the tests paragraphs, and to the standardization of drugs, so that in addition to being an invaluable work of reference for the medical profession it also is of decided value to the dispensing, manufacturing and analytical chemist. In the present work criticisms of the Pharmacopœia will be supplemented by the results of a large amount of original investigation carried out in the author's laboratories during the last six years. So that in addition to having official standards, and criticisms on the official standards, the manufacturing and analytical chemist has the advantage of figures and data yielded by the examination of authentic specimens of the various drugs, in the author's own laboratories. This book will be published by Messrs. J. and A. Churchill, price 14s. net.

The Extra Pharmacopœia, by W. Harrison Martindale and W. Wynn Westcott, will appear within the

next few weeks. Fifteen editions of this useful work of reference have already appeared, and the present is the sixteenth of the series. The subject matter has so largely increased that with the Fifteenth Edition it was found necessary to divide the book into two volumes. Volume I containing the Extra Pharmacopœia Chemicals, Drugs and Materia Medica: manufacture, dose, and methods of administration, &c., whilst Volume II contains mainly matters connected with Analytical, Experimental and Bacteriological Research, &c. Volume I contains an account of the changes in the new British Pharmacopœia, and indicates the more important additions and deletions. The medical references have been brought thoroughly up to date, and the chapters on Vaccines, Tuberculins and Organotherapy have been revised and greatly extended. The book is published by Mr. H. K. Lewis, of 136, Gower Street, W.C., price 14s. net. Volume II contains information on the assay of drugs, chemicals and organo-therapeutical medicaments, the composition of mineral waters, the means available for standardizing disinfectants and antiseptics, and many other knotty problems. This volume also is published by Mr. H. K. Lewis, of 136, Gower Street, W.C., price 7s. net.

Thompson's Compendium of the Pharmacopœias and Formularies (Official and Unofficial).—The fifth edition of this well-known and invaluable work is announced as being in the press by Messrs. John Bale, Sons and Danielsson, Ltd., at the price of 5s. net. It has been completely revised to accord with the 1914 Pharmacopœia, and, as with the previous editions, will undoubtedly be welcomed and appreciated by the profession at large. Its size is 6 in. × 3½ in., bound in blue leather, and the publishers claim that no other book of its size contains the same amount of varied and useful information on all subjects of practical interest to medical men. According to an abridged epitome of the contents, which we have been privileged to see, the book will contain the recent and unofficial remedies, unofficial and useful formulæ, food for invalids, an index of diseases and remedies, a table of incompatibilities, synonyms for drugs, chemicals and preparations, a table of solubilities, dosage tables, a list of special and general pill excipients, notes on urine analysis, bacteriological notes, stains for microscopical work, notes on milk analysis, spray inhalations, formulæ for general spinal anæsthesia, colour tests for alkaloids, a synopsis of the Austrian, Belgian, Danish, Italian, Russian, Portuguese, Netherlands, and United States Pharmacopœias, as well as the French Codex and the Pharmacopœia Germanica. In addition will be found a synopsis of the British Pharmacopœia, 1914, and of the Indian and Colonial Addendum to the British Pharmacopœia, a posological table, the Poison and Pharmacy Act and Poison Regulations, a list of poisons, emetics and antidotes, notes on the preparation of medicated baths, a list of special tests for drugs and chemicals, formulæ for hypodermic injections, a midwifery table, a list of terms used in prescriptions in Latin and English, a list of foreign terms used in prescriptions, also many other useful tables, including weights, specific gravity, and boiling and melting points will appear. This book is arranged to slip handily into the pocket, and so prove of the utmost convenience to the practitioner who has great demand on his time, as it takes up a minimum of space while containing the maximum of information.

Synopsis of the British Pharmacopœia, 1914, compiled by H. Wippell Gadd (publishers, Messrs. Baillière, Tindall and Cox, price 1s. net), has now reached its Eighth Edition which is sufficient proof of the usefulness of this little volume. As the author remarks in the Preface, it is a summary intended for the needs of students and as a pocket reminder for medical men and pharmacists. It affords an easy means of seeing at a glance the principal alterations in the strengths and standards of the drugs official in the new "British Pharmacopœia, 1914." The important alterations are marked by a very clear distinction of type, whilst another useful edition is the method of marking the drug or preparation with the figures (1) or (2) so as to show into which part of the Poisons Schedule the particular preparation falls. The section on the Poison Laws has been revised in accordance with recent Orders in Council. The book also contains a list of the deletions and the additions to the Pharmacopœia; abbreviations, definitions of various analytical constants; a list of the alcoholic solutions of the British Pharmacopœia, 1914, used as menstrua and solvents; symbols, atomic weights, &c., a table of comparison of thermometric scales, weights and measures of the British Pharmacopœia, including also the imperial system. Copies of the book can be obtained from Messrs. Baillière, Tindall and Cox, or from any bookseller, price 1s. net.

The Prescriber's Formulary and Index of Pharmacy, by T. P. Beddoes, M.B., B.Sc., F.R.C.S., published by Baillière, Tindall and Cox, price 2s 6d. net. We understand that a Supplement to this useful little volume will shortly be published bringing it up to date, and including the alterations and additions to the "British Pharmacopœia." The great value of this little work is that within a handy and convenient compass it includes almost the whole of the Official preparations, and at the same time a great number of the more important Not Official preparations, and by a careful distinction of type it is possible to see immediately into which category the preparation in question falls. In the case of a large number of the Not Official preparations they are marked so that the reader can judge whether they are of sufficiently established repute to be included in the new and Not Official remedies published yearly by the American Medical Association. This Supplement will be eagerly anticipated as it will bring up to date a work of reference which has been already found extremely useful by the medical profession. Copies of the Supplement may be obtained from the publishers, Messrs. Baillière, Tindall and Cox, of 8, Henrietta Street, Covent Garden.

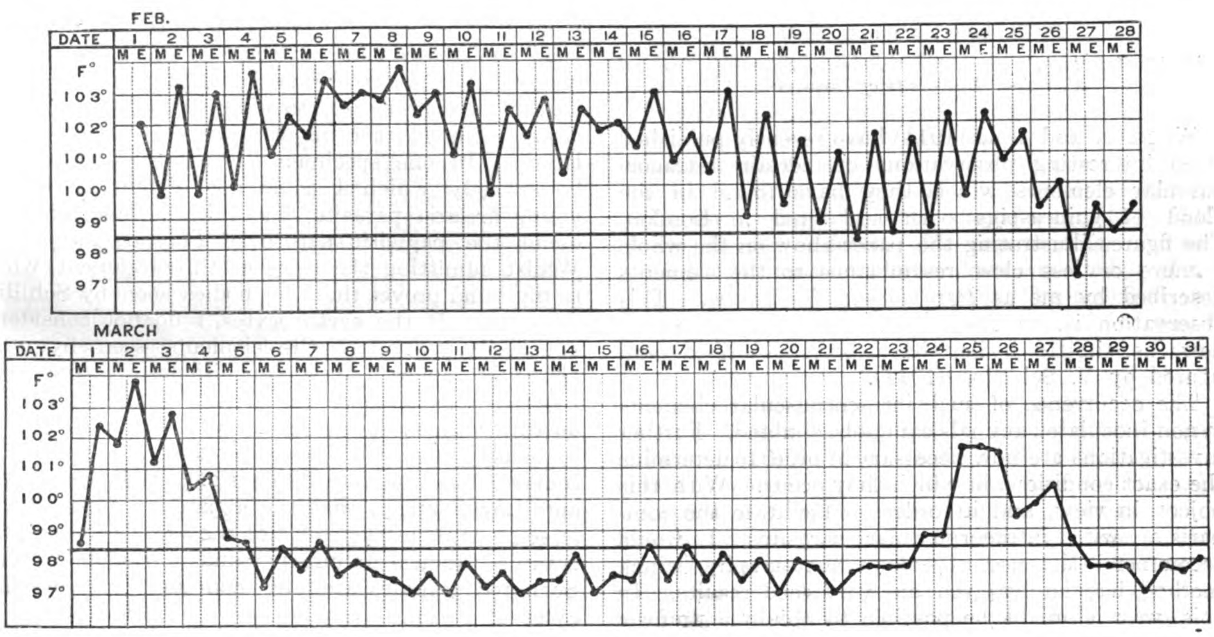
Original Communications.

BRIEF NOTE ON A CASE OF TRIPLE INFECTION: TYPHOID, PARATYPHOID A, AND PARATYPHOID B.

By Aldo Castellani, M.D.

Director, Government Clinic for Tropical Diseases, Colombo, Ceylon.

Cases of contemporaneous double infection, typhoid and paratyphoid A or B, have been placed on record by several observers, and I have seen several such cases in Ceylon, but to my knowledge no cases of triple infection—typhoid and partyphoid A and paratyphoid B—have been published. The following case, therefore, may be of some interest.



A Case of Triple Infection.

Mr. E., American, aged 50, was on a pleasure trip round the world in 1913-1914. In January, 1914, while in India, he began feeling unwell, tired and feverish. Took large doses of quinine, which did not influence the fever. He arrived at Colombo on January 31, and, feeling very unwell, consulted me the same day. Temperature 102° F., pulse 90, tongue coated, slight abdominal distension, spleen just palpable, no roseola. I took him to a nursing home and treated him for enteric on the usual lines. He had several extremely serious hæmorrhages a few days after entering the home, and his condition became very serious: the course was very prolonged, two relapses taking place, the last a short one, but with signs of severe cystitis. He finally recovered completely and left Ceylon in April, 1914.

Bacteriological Examinations carried out.—The blood was tested for serological reactions six times during the whole course of the malady; twice during the first week in the home. The stools were bacteriologically examined twice during the last relapse, when the patient began complaining of urinary symptoms.

Blood.—Serum reactions, tested six times against *Bacillus typhosus*, *B. paratyphosus* A and B; during the whole course of the disease and convalescence agglutinated completely all of them, the average agglutination limits being represented by dilutions of 1 in 80 for *B. typhosus*, 1 in 60 for *B. paratyphosus* A, 1 in 80 for *B. paratyphosus* B. Owing to objections on the part of the patient's relations no hæmocultures were carried out.

Absorption Tests.— Serum reactions are not sufficient to make a diagnosis of mixed infection, because multiple agglutination does not always mean multiple infection. Absorption tests carried out twice showed the typhoid, paratyphoid A, and paratyphoid B agglutinins to be specific.

Stools.—The stools were bacteriologically examined four times; on the first occasion, before the hæmorrhage took place, *B. typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B were isolated. On the second and third occasions only *B. typhosus* and *B. paratyphosus* A were grown.

Urine.—On the two occasions when the urine was bacteriologically examined, *B. typhosus* and *B. paratyphosus* A were isolated.

Remarks and Conclusions.

It would seem to me that the patient was suffering from a contemporaneous triple infection, viz., typhoid, paratyphoid A, and paratyphoid B, as the three germs were isolated contemporarily from the stools on one occasion, the blood agglutinated

the three micro-organisms during the whole course of the disease, and absorption tests showed the agglutinins for each germ to be specific.

Such cases of multiple triple infection must be rare, but those of mixed double infection—typhoid + paratyphoid A or B—are not so rare in Ceylon, where I have seen also mixed paratyphoid A and paratyphoid B infections. They all serve, in my opinion, to emphasize the advisability of using for prophylactic purposes the combined typhoid + paratyphoid A + paratyphoid B vaccine, as introduced by me and used since 1905, instead of the simple typhoid vaccine as generally done.

INTRACORPUSCULAR BODIES IN GUINEA-PIGS' BLOOD AND YELLOW FEVER.

By Harald Seidelin, M.D.

Scientific Secretary, Yellow Fever Bureau, School of Tropical Medicine, University of Liverpool.

Wenyon and Low (1914) have recently published some interesting observations on certain intracorpuscular elements which they have found in the blood of guinea-pigs born and bred in London. The figures illustrating the paper show on the whole a more or less close resemblance to the elements described by me as *Paraplasma flavigenum*. This observation is, as the authors state, not altogether new, as similar bodies have been described and figured by V. Schilling (1912).

The occurrence of such intracorpuscular elements in non-inoculated animals cannot be doubted. Further investigations are now necessary in order to determine the exact conditions in which they occur. With this object in view, and in order to facilitate the comparison with intracorpuscular parasites, I would recommend the use of colour photography, which method has lately given me very good results. In this way it might be possible to obtain a uniform material for demonstration, and to submit controversial points to a larger tribunal of scientists than has hitherto been practicable. In future work I intend to make use of this method, whenever conditions make it possible; I can only regret that such a method was not available when I, some years ago, worked in Yucatan, where I obtained the most valuable material I have had at my disposal.

Though I am unable to discuss the observations of Wenyon and Low, whose specimens I have had no opportunity of examining, I have very serious objections to make to their discussion and conclusions. The first question which arises is, of course, whether the elements observed in non-inoculated animals are parasitic or not. Wenyon and Low decide promptly that they are not parasitic, their argument being that these bodies occur in the blood of newly born animals. Their statement with regard to this point is, however, not quite clear. They say, "They are not parasitic because they occur in the blood of newly born animals, not forgetting even the possibility of placental transmission." If the latter possibility is to be taken into account the reason given is obviously not sufficient to repudiate their parasitic nature. But before discussing this point it would be necessary to know what is to be understood by "newly born animals." If the animals have been examined immediately after being born, the argument holds good as far as it goes, but if some days have been allowed to pass after birth before the time of examination, the possibility of extra-uterine infection will have to be admitted, in which case one would expect that the parasites should be most numerous in very young animals, namely, in cases of recent infection. On the whole there is an unfortunate lack of detail in Wenyon and Low's communication, which makes a control of their statements a matter of difficulty.

A much more important argument against the parasitic nature of the bodies is, in my opinion, that Schilling has found them numerous in cases of experimentally produced toxic anæmias. Dr. Schilling was good enough to send me some of his specimens, in which I saw many forms, some of which I should hardly have been able to distinguish from *P. flavigenum*, although the majority were both denser and larger. In one specimen I saw also at least one larger body which I could not distinguish from a young malaria parasite, but this did not make me doubt the parasitic nature of *Plasmodium præcox*. Whilst admitting the force of this argument, which to my mind proves that the bodies seen by Schilling form part of the erythrocytes, I do not consider it conclusive as far as the elements seen by other observers, under different conditions, are concerned. I regard it as an open question, whether we have to do with various species of Babesia-like parasites or, in some cases, with erythrocyte constituents. A somewhat curious possibility is suggested by Wenyon and Low, namely, that the apparent parasite might in some cases be the result of the association of a red granule—nuclear remnant—and a basophile patch. Such red granules are fairly common in the erythrocytes of various animals and in various forms of anæmias in man. That they are remnants of nuclei has, I believe, been the generally accepted opinion for a good many years (Jolly bodies), and is not, as Wenyon and Low have it, "an idea suggested by Schilling-Torgau." Basophile granules are, of course, likewise well known. Nuclear remnants may occur in cells with basophile granules, but this is not common; and perhaps even more uncommon is the occurrence of a single basophile granule in an erythrocyte; they are usually quite numerous. The suggestion is, therefore, that, accidentally, the rare occurrence of only one basophile granule might coincide with the rare occurrence of a nuclear remnant in a cell with basophile granules; moreover, these two granules might accidentally be in close apposition so as to produce the appearance of a parasite! For each time that such a curious combination occurs, we would obviously have to expect hundreds, or more probably thousands of erythrocytes with nuclear remnants and as many others with ordinary basophile granules. This has

apparently not been the case in the specimens examined by Wenyon and Low, and it has certainly not been the case in my specimens, whether from man or from guinea-pig; nuclear remains have been very uncommon, whilst basophile granules have been exceedingly rare.

Personally I have examined the blood of a large number of guinea-pigs in Liverpool, and I have never observed elements which could be mistaken for Paraplasma except in animals inoculated with the strain I had brought from West Africa.

The question of natural infection of guinea-pigs with similar parasites has been discussed both by myself (1912) and by Macfie and Johnston (1914). In both these papers numerous control examinations have been mentioned; thus, Wenyon and Low have no right to make it appear that no control examinations had been made. They refer to my paper in very strange terms, saying "Seidelin . . . claimed that he had found similar bodies in guinea-pigs inoculated with yellow fever blood, in fact, claimed that he had produced yellow fever in guinea-pigs." With regard to the first part of the sentence, I not only stated in detail what I had found and illustrated my findings by exact and well-reproduced figures, but I demonstrated specimens on many occasions—at a meeting of physicians in Merida, at a meeting of the Pathological Society of Great Britain and Ireland, during the International Congress on Hygiene in Washington, and to many visitors to my laboratory. Two of these specimens are still in existence, though now less suitable for demonstration because of having faded; re-staining has not been very successful, as everybody knows that it seldom is. With regard to the second part of the above sentence, anyone who will read p. 192 of my Yucatan Report will see that I discuss the possibility of a spontaneous infection with a Babesia, as it has been described by Baldrey (1910), at the same time emphasizing that the importance of a single positive result, which was all that I had obtained at the time of writing, should not be considered great. Thus, no conclusions were easily jumped at.

With regard to the question of artefacts, Wenyon and Low make somewhat contradictory statements, but on the whole do not appear to regard such as an important source of error. In this I quite agree; clean specimens can be obtained without difficulty in temperate and in dry tropical climates, whilst in damp tropical climates, as that of the West African Coast, for instance, they can only be secured if smears can be fixed and stained immediately after being prepared. Thus, artefacts may probably be left out of discussion, at any rate as far as observers of experience are concerned. We have probably all occasionally been in doubt when we first started examining for malarial parasites, but later on such a doubt is not likely to arise. With regard to sections, Wenyon and Low fail to see how it is possible to detect and identify such bodies. Many years' work in pathological histology is, of course, a useful preparation for such examinations, and the use of my iron-hæmatein technique is an important factor. With this technique it is possible to obtain absolutely clean and remarkably clear preparations in which the erythrocytes can be examined almost better than in a blood film; in this respect the results are very much superior to those obtainable by the various iron-hæmatoxylin methods.

Leaving the question of artefacts out of the discussion, I am quite prepared to admit that the nature of the bodies found in the blood of guinea-pigs, inoculated and non-inoculated, requires further investigation. But whilst admitting this, I must strongly protest against the way in which Wenyon and Low refer to investigations which have given results different from their own. Their remarks might convey the impression that no control examinations have been made by others, but, as mentioned above, this is very far from being the case. Considerable evidence has been given by the authors mentioned, and, as far as I am concerned, I have no doubt that the inoculations have been successful.

The limit of unwarrantable criticism is, however, reached in Wenyon and Low's conclusion No. 5: "The evidence in favour of the yellow fever bodies being parasites thus breaks down." The foregoing conclusions all deal with guinea-pigs, but, so far, no one has used the experiments on animals as decisive evidence in favour of the importance of *P. flavigenum* in yellow fever. The experiments have been regarded as means by which our knowledge of the disease and of its parasite might be acquired; but the material on which the claim to the discovery of the latter is based is that which has been recovered from human cases. This evidence can only be discussed on the basis of direct observations in the field; it cannot be destroyed by a stroke of the pen, supported only by the examination of some guinea-pigs in London. In this connection it seems hardly appropriate that authors who are not known to possess much personal experience of yellow fever should criticize with an air of superiority the clinical diagnosis. Wenyon and Low say, referring to my own attack of fever in Yucatan: "He himself had admittedly suffered from an attack of yellow fever some years before, and but for the finding of the bodies in his blood, we are sure would never have diagnosed his complaint as yellow fever." A knowledge of recent literature ought to make it clear that various authors, including myself, and all with considerable experience of yellow fever, would feel much inclined to regard mild febrile attacks with transient albuminuria, jaundice and bradycardia, as mild forms of yellow fever. The notes of the case also show that two local physicians concurred in the diagnosis, one of whom is regarded as the greatest authority on the subject in Yucatan, whilst the other has had exceptionally good opportunity during a number of years of observing all cases in the isolation hospital and many cases in the town. It has struck Wenyon and Low that parasites were more abundant in this mild case than in others more serious. This is, in effect, striking. My explanation is that the blood was examined from the very

beginning of the illness; how it should be explained on the supposition that the yellow fever bodies were the result of pathological changes of the erythrocytes I fail to see. I also fail to see the meaning of the remark about a mild febrile attack—"a common enough condition in those residing in tropical climates." Are Wenyon and Low really satisfied with the diagnosis of "fever," because the sick person lives in the Tropics? At home the careful physician would always attempt to arrive at a more definite diagnosis, and he certainly ought to do the same in the Tropics, more especially in a case which can be carefully studied throughout the course of the illness.

It ought also to be well known that I am not the only author who has admitted that the occurrence of second and even third attacks of yellow fever is not quite unlikely. If I am right in assuming that I have three times been infected with the yellow fever virus, twice by natural infection and once experimentally, then the three infections show just the sequence which we would expect with regard to their intensity; the first time a fairly mild attack, the second time a very mild one, and the third time only a slight reaction on an immunizing dose, which of course nobody would ever call "an attack of yellow fever," as I previously have stated (1914).

The "extreme," as Wenyon and Low call my suggestion that a vaccination against yellow fever should be attempted, is simply the logical outcome of previous work. If yellow fever has been successfully transmitted to animals then we have very good reason to hope that vaccination will soon be in view. Considering the large number of valuable lives lost through yellow fever, this possibility appears much too serious to be put half jokingly aside by anybody who wants to be regarded as a serious investigator. It would not be difficult to investigate this point further. It is only necessary to inoculate a non-immune individual from a guinea-pig inoculated after a few passages through animals following the original inoculation from a human case. I regret that I am no suitable subject for such an experiment, but I am perfectly willing to undertake the following control experiment on myself at the same time. I would inoculate myself with blood from a guinea-pig as mentioned, and a few weeks later with blood from a yellow fever patient in an early stage of a severe attack. A positive result of the latter experiment would almost disprove the transmission to guinea-pigs, and would throw serious doubt on the diagnosis of yellow fever in my previous attacks. I believe that the importance of the matter would fully justify such experiments.

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Infantile Scurvy.—Hess and Fish (*Amer. Journ. Diseases of Children*, Chicago, December) have studied the cause of bleeding in infantile scurvy, including a consideration of the clotting-power of the blood. For the coagulation tests blood was aspirated directly from the blood-vessels and oxalated. This plasma showed a slight diminution in clotting-power. This defect did not seem, however, to be the result of an insufficiency of calcium. The antithrombin was not increased. Small amounts of blood were also obtained by puncture of the finger. Examinations of this blood revealed a normal number of blood platelets. In other respects the picture was that of a simple secondary anæmia, except that the hemoglobin was diminished out of proportion to the red blood-cells. A marked regeneration of these cells during convalescence, leading to a polycythemia, was also noticed.

As these various departures from the normal are insufficient to account for the hæmorrhages associated with the disease, the integrity of the blood-vessels was investigated. The vessels of normal infants were found to withstand, without apparent disturbance, 90 degrees of pressure for three minutes, whereas the vessels of infants suffering from scurvy gave way under this pressure. Numerous petechial hæmorrhages of the skin or mucous membranes were frequently noted as one of the earliest signs of the disease. The well-known "exudative diathesis" of Czerny was found definitely to predispose to the development of scurvy.

Several cases of scurvy developed in infants who were being fed on milk which was pasteurized to 145° F. for thirty minutes. They were cured by receiving fruit-juices or raw milk. Orange-juice was found not to lose its efficacy as the result of being boiled for ten minutes. The juice of the peel was successfully substituted as an antiscorbutic for the juice of the orange. Potato proved to be an excellent antiscorbutic. It is suggested that it be added to pasteurized milk as potato-water instead of the barley-water which is now commonly used as a diluent. In this way the necessity will be obviated of giving orange-juice. Cod-liver oil or olive oil, although given for weeks, did not prevent the development of scurvy.

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FEBRUARY 15, 1915.

NURSING AND NURSES.

NURSES are much in evidence at present, for their work at the seat of war is prominently before the public. That they are doing good work at the base hospital is undoubted, and British nursing stands on a high, perhaps the highest, platform both in war and peace. The policy of keeping women at a distance from the actual Front has been followed in our wars of recent years, although we hear of protestations that this is not desirable. In any argument of the kind the question of training comes to the front, and it is well to appreciate at once what the nurses, military or civil, are trained to do. The word "hospital" nurse is the term usually applied to women who have had hospital training: it is a fitting and appropriate title, and one which states what is meant and should be taken to mean actually what it implies.

A hospital nurse is trained for hospital work, that is for the nursing of severe cases of illness; for hospital cases are all of some, and usually of great, severity. In private work also, or in nursing homes whither the hospital nurse drifts after finishing training, the nature of the ailments she has to treat are of a severe nature as a rule, for ordinary ailments are dealt with at home and not in nursing homes. But the great majority of illnesses are not due to severe injury nor to alarming conditions; they are of the nature of colds, coughs, colic, vomiting, headaches, diarrhœa, sprains, measles, abscesses, earaches, and the multitude of familiar troubles that afflict the young. Even should they go to an out-patient department of a hospital the "nursing" has to be done at home. For these illnesses the hospital nurse is not called in, but the work is done by the mother or other relation. It is evident, therefore, that the trained nurse is not, and cannot be (unless every woman is a trained nurse), available for the nursing in the majority of illnesses; in other words, the vast majority of the afflictions which beset mankind.

In war, also, the hospital nurse, it must be remembered, is but a trained hospital nurse, that is for work at the base of operations, where the hospitals are conducted on lines similar to the civil hospital with the work of which she is familiar; beyond the hospital, however, the work is quite outside her training.

To render first aid, to lift and carry wounded, to improvise dressings, splints, bandages, sterilizers, and even the very hospital itself, its tables and appliances, has not been included in the training of the nurses in our civil hospitals. That some have done this, and done it well, is well known, but it is not part of the training, for in the hospital everything is to hand; but at the Front—in war, in the railway train, with a pile of wounded, dying, and dead in the village cottages, school houses, or barns, where the wounded are scattered and the regulations, regularity, and discipline of the hospital is not, and cannot be, followed or maintained, the hospital nurse is at a discount, and apt to be at a loss. It is evident, therefore, that there are limitations to the work of the hospital nurse, leaving a gap in the world's requirements in cases of injuries in peace and war. It is to provide men and women for this purpose that the so-called ambulance teaching now so widely followed in Great Britain was introduced. In the field of first aid in civil life the good is apparent, and the medical profession now fully recognize its importance. In the sphere of nursing, this recognition is not so apparent, and the hospital-trained nurse has not yet realized the difference between hospital and war or home work. "Home nursing" is the term applied to the teaching of ambulance societies in the department of nursing—a term wisely chosen, and strictly adhered to by the authorities who determine the nature of the teaching they give.

The other great gap in attendance upon the injured in war is supplied by the Voluntary Aid Detachments which exist in Britain, although not in such numbers as they should be. The members of these detachments are not trained nor are they intended for hospital work. Their education is confined to "first aid," to moving wounded, attendance in the open, in the railway wagon, in the barns or railway sheds, on the roadside or in the canal barge, camp cooking, improvised laundry work, camp sanitation, &c. This is the sphere of women's work in Voluntary Aid Detachments, and for that they have undergone years of constant and careful training. They are not hospital nurses, nor is the hospital training a necessary or fitting training field for them; but in the sphere for which they are enrolled, trained, and equipped, they are proficient. The hospital nurse's duty is at the base or stationary hospital, for where she has been trained; if she wishes for work beyond that she must have had the necessary education, for the sphere and work of the two classes are as distinct as that of the surgeon from that of the "first aid" men and women so plentifully in evidence amongst us.

As the Voluntary Aid Detachment members have their sphere, namely, outside the hospital, for which alone they are intended and trained, so the hospital nurse is intended for hospital work only, unless she has had the necessary education fitting her for work outside. Until this principle is fully understood and followed, inefficiency is sure to follow, for each have their sphere and neither can undertake efficiently the work of the other.

In the Tropics more than at home the question of "home nursing" is all-important. Nursing tropical cases are as distinct from the ailments dealt with in home hospitals as is the work of the hospital nurse from the Voluntary Aid Detachment member in the time of war. Nurses proceeding to the Tropics are encouraged, and, in many instances when going to Government employ, are compelled to undergo a training in tropical work before leaving home. But as at home trained nurses do not deal with the majority of our ailments, so in the Tropics the women have to look after the men stricken with an attack of malaria, of dysentery, of dengue, and the innumerable troubles that assail Europeans in the Tropics. Home nursing, therefore, should be taught to all women going to tropical countries, for upon them will fall the duty of attendance, and upon their knowledge, especially in remote parts of the Empire, where no hospital nurse is to be met with, the life of her neighbours may depend.

These remarks may help to define the place of women in the sphere of nursing; for hospital nurses cannot do all the work, their duties are well defined and unfortunately limited; but the work outside our hospitals and private nursing homes has to be done in war, in peace, at home, and in the Tropics, by others: and the several bodies now giving such instruction to the public are fulfilling a high duty by equipping the women of this nation to fit themselves for what is required of them in the many spheres of usefulness which Imperial needs demand of them.

Annotations.

Banti's Disease: Report on Operative Cases.—J. Sailer (*Penn. Med. Journ.*, Athens, xviii, No. 2, pp. 91-170) performed three notable splenectomies. Two of the patients recovered and one died, but in the last case death was due less to the operation than to the massive hæmorrhages that preceded it, and in the hope of stopping which the operation was performed. One patient never had massive hæmorrhages, but occasionally had severe attacks of pain in the intestines, after which occult blood could be found, and on one occasion had an attack of pain in the left flank, subsequent to which blood was found in the urine. The interesting features of the first case are the comparatively brief course, two and one-half years; the severe paroxysms of pain which can be ascribed to hæmorrhages not only from the gastro-intestinal tract, but also from the kidneys; the large size attained by the spleen in the short time; the absence of any sign, macroscopically, of change in the liver at the time of the operation; a prolonged and complicated post-operative period and ultimate apparent recovery. The three cases are reported in detail.

Experimental Study of Methods of Prophylactic Immunization against Typhoid.—F. P. Gay and E. J. Claypole (*Archives of Internal Medicine*, Chicago, November, xiv, No. 5) draw attention to the reputed advantages of living sensitized typhoid vaccine (Besredka) as opposed to other types of vaccine. The many vaccines that are still being advocated indicate that the best vaccine has not yet been found, and that the best method of proving which is the best vaccine has not been determined. Sensitized cultures of the typhoid bacillus, whether whole or as sediment, produce little or no reaction in human beings, with the possible exception of those who have previously suffered from typhoid or have been immunized. By comparing their results with those of certain other observers the authors conclude that a considerable degree of reaction, both local and general, is avoided by the use of these sensitized cultures, which possess the further advantage, so far as their experimental work can determine, of producing a more durable type of immunity. Vaccination at short intervals (two days) in human beings is rendered quite possible with the mild vaccine they employ, and is evidenced from animal experimentation, as giving rise to less toxic effect and to fully as durable an immunity as vaccination at longer intervals. This type of vaccination has the further advantage of completing the prophylactic treatment of three injections within a week. A polyvalent vaccine derived from strains of the typhoid bacillus isolated in the vicinity of patients who are to be treated is advantageous, judging largely from the work of other observers. A further advantage in the use of sensitized cultures is that a polyvalent vaccine, no matter

how recently the strains may have been isolated, is also almost entirely free from untoward effect. They recommend for prophylactic immunization against typhoid three injections of the sediment of a dried, ground, sensitized culture of several local strains of the typhoid bacillus mixed together, given at two-day intervals and in a dosage of $\frac{3}{32}$ mg. of the original dried culture, which corresponds, as has been determined, to a dosage of approximately 750 million living typhoid bacilli.

Anaphylaxis from Antitetanus Serum.—Simon (*Münch. med. Woch.*, November 10, lxi, No. 45) had four rapidly fatal cases of tetanus among the 700 wounded in his service during four weeks. Then came a series of four mild cases with recovery under antitetanus serum treatment. In two other cases tetanus developed soon after a shell injury of the upper arm. One man was given 200 antitetanus serum units, both intravenous and intraspinal, repeated the next day, and followed daily with 100 units intravenously after the arm had been amputated. He was progressing favourably until the intravenous injection on the fourteenth day was followed by signs of severe anaphylaxis. Under stimulants in an hour he recuperated. The next day he developed an exanthem. No further antitoxin was given, and in a few days all traces of the tetanus had vanished. In the other case there was some twitching in the arm and face, but as this subsided after intravenous injection of 300 units the assumption of tetanus seemed to have been erroneous. Thirteen days later the symptoms returned in a severe form and the intravenous injection of 300 units was repeated. It was followed in a few minutes by cyanosis, a chill, and temperature of 40·9° C., but the pulse kept good. After this partial shock had subsided there was no return of the symptoms of tetanus. Three days later, the seventeenth day after the first injection, 100 units were injected intravenously again, and this time a typical severe anaphylactic shock ensued at once, with total unconsciousness for half an hour and marbling of the body, the pulse scarcely perceptible, and finally a chill and temperature of 40·1° C. The recovery from the shock was rapid and complete in both cases. By the next day the pulse and breathing were normal, and the men felt none the worse for it. These cases suggest that the tenth day seems to be the danger line. In a more recent case, after the patient had been given 1,000 units of the serum in the course of ten days, Simon changed to magnesium sulphate, injecting subcutaneously every day from 40 to 60 c.c. of a 25 per cent. solution. This patient is now practically cured.

Rocky Mountain Spotted Fever.—L. D. Fricks describes ("Public Health Reports," vol. xxx, No. 3, January 15) the investigations and measures of eradication undertaken during 1914. The investigations consisted of work on the immunity of the ground squirrel (*Citellus columbianus*) and experiments on transmission of the disease to guinea-pigs by biting insects other than the wood-tick.

Dermacentor Andersonii.—The inhabitants, knowing the source of the disease, protect themselves by avoiding woods and uncultivated lands during the tick season, and when this cannot be done wear suitable clothing and search for tick-bites.

Reclamation and cultivation of arable land continues slowly. This measure cannot greatly help tick eradication, even when combined with burning out the foothills, with the consequent danger to standing timber.

Destruction of wild animals is done by shooting, trapping, and poisoning; carbon bisulphide pumps are used extensively for the destruction of ground squirrels. Poisoned grain is distributed to farmers.

Dipping of Domestic Animals.—For this purpose conduit traps have been used since 1911, containing arsenical solution as early as the cold weather permits, about mid-April or mid-May. Soon no ticks were found on dipped cattle, but were found on horses after three dippings at ten-day intervals, continued approximately six weeks for cattle and two months for horses with some irregularity during April on account of the cold weather. Dipping of domestic animals alone causes no diminution of the ticks and is insufficient to eradicate spotted fever, but combined with destruction of small animals results in a great reduction of the tick infection.

Sheep grazing was begun in 1913 and is beneficial, because (1) by close grazing the undergrowth, where the ticks rest, is destroyed; (2) others, domestic or wild animals the hosts of the adult ticks, are destroyed or removed; (3) ticks themselves are destroyed principally by means of the lanoline in the wool of the grazing sheep. It may be carried out extensively without cost.

The experiment began on April 15, and terminated July 15, when the sheep were sheared, dipped, and returned to their owners; frequent examination of sheep for dead and live ticks indicates that fifty times as many are killed as by the regular dipping of all other domestic animals, but three years are required to determine the full benefits to be derived from sheep grazing; but in certain districts this measure alone does not entirely eradicate the wood-ticks. Where success has been obtained it was due to close grazing for a week to pick up practically all the ticks in the locality and destroying, perhaps, 90 per cent. of them; then the sheep are removed straight back into the mountains at an elevation of 10,000 ft., where the engorged ticks drop the larvæ, where on hatching there are few suitable hosts, ten days being the average time before the ticks are fully engorged and ready to drop off for egg-laying.

In California no cases of spotted fever have been reported since 1912, but there is no reason for believing the infection has spontaneously disappeared.

In Colorado, without doubt, spotted fever is present and probably a few cases occur each year. In Idaho cases have occurred for several years past: in 1914, 386 cases, with 15 deaths are reported: in 1913 there were 239 cases, with 4 deaths. In Montana 12 cases

and 7 deaths. In Nevada 9 cases and no deaths. In Oregon 6 cases reported with 3 deaths. The high mortality rate is probably due to other cases not being reported. In Utah the disease is not declared so that it is impossible to furnish accurate data, but several deaths were due to this cause in 1914, and there is reason to believe the disease occurs. In Washington and Wyoming cases are reported, but accurate records have not been kept; in the latter 372 cases with 29 deaths is the approximate number up to 1914.

Abstracts.

PLAGUE IN HAVANA.[1]

By G. M. Guiteras.

THE first case of plague known to occur in Havana, Cuba, was discovered July 6, 1912. Two additional cases occurred July 12 and 22, about four blocks distant from the first case. The district involved in this infection is about three blocks distant from the water front and in the wholesale commercial district of the city.

The infection was a direct importation from the Canary Islands. This outbreak was confined to the three cases mentioned above.

About one year and a half later, that is, February 22, 1914, the first case of plague of the present outbreak was discovered in the block adjacent to that in which the first two cases occurred in 1912. Whether this second appearance of plague was simply a continuation of the old infection or a new importation is a moot question. The former is the more reasonable view. The case of February 22 was followed by twenty-four other cases, making a total of twenty-five within the city of Havana. The last case occurred June 22.

Two other cases were found in the neighbourhood of Havana, the first 45 km. to the south-west of the city, April 18; the second at a town about 25 km. south-east from Havana, June 15. As the infection in both these cases was clearly traceable to Havana and they were treated in that city, these properly belong to the Havana series.

May 30, an infected rat was found in the freight station in a town 37 km. to the eastward of Havana, on the railway between that city and Matanzas. The station and surrounding structures were disinfected and there were no further developments.

June 23, a case suspicious of plague was reported from Santiago de Cuba in the eastern extremity of the island. Later it was confirmed, after inoculation tests and the exposure of guinea-pigs in the infected locality had shown positive results. Plague-infected rats were found about the same time.

It may be considered as more than probable that the spread of plague infection outside of the original focus in Havana was due to the action of a wholesale provision merchant who, when one of his employés sickened with what he thought might be plague, and later was confirmed as such, concealed it, and, knowing that as soon as the case was discovered his warehouse would be quarantined and fumigated, disposed of as much of his stock as possible, sending it to various parts of the city of Havana and throughout Cuba, including the subsequently infected points.

It should be observed that two weeks prior to the appearance of the first case of the present outbreak in Havana the sanitary authorities had noted some rat mortality. Anti-rat measures were put into effect at once, even before the discovery of the first human case of plague. With a few exceptions all the cases may be traced directly or indirectly to the original focus near the Havana water front.

A secondary well-marked focus developed later in the extensive stables of the Department of Public Works. Two infected rats were found here: the first, April 17; the second, April 24. These are the only infected rats found in Havana. This focus gave rise to six cases.

On account of the character of the stable buildings and grounds, disinfection by the usual methods was futile and the Sanitary Department decided to destroy the infection by fire. The stables and everything within them, except the animals, carts and harness, were converted into ashes, April 25. This radical measure was effective in destroying a very menacing focus of infection. No other case developed from this source, except perhaps Case 25, in which the place of business of the patient was on the route taken by the employés, animals, and equipment of the stables destroyed, when they were moving into new quarters.

Sanitary measures throughout the Island of Cuba are under the control of the Department of Health and Charities, the head of which is a Cabinet officer. The Secretary of this department is at present Dr. Enrique Nunez, a physician. The actual work of sanitation, however, is in charge of the Director of Health, Dr. Juan Guiteras.

Every municipality throughout the island has a chief sanitary officer reporting to the Director of Health. In Havana the Government maintains the hospital for the care and treatment of all cases or suspected cases of communicable diseases, which hospital is in charge of the Director of Health, as is also the well-equipped laboratory connected with the department. In normal times a personnel of about 100 men is kept on duty inspecting, fumigating, and rat-catching. In times of epidemic outbreaks, as in the present case, this number is very materially increased.

The sanitary measures put in force during the present outbreak of plague are directed primarily against the rat and flea, and may be considered as follows:—

The relation existing between the inhabitants, the hospitals, and the medical profession facilitate inspection. The Spanish-born population of Havana are affiliated to two social and mutual aid societies. In addition to these societies there is a rich and power-

[1] Abstracted from the *Journal of the American Medical Association*, January 2, 1915.

ful organization known as the Association of Employés, to which all Spanish and Cuban employés are eligible for membership, although it is largely made up of the former. The three associations have a combined membership of about 75,000 men. All these organizations maintain hospitals and dispensaries for the benefit of their members.

Citizens of Cuba not affiliated with the societies mentioned above, when ill, are entitled to the benefits of the State dispensaries. The sanitary inspectors of this department respond to the calls made on them by those in need of medical assistance and investigate reports of disease made by the police authorities, taking such action as the case may demand.

The well-to-do are treated by their own physicians, who, in accordance with the sanitary laws and regulations, must at once report to the health authorities all cases of communicable diseases.

All suspicious cases are at once removed to hospital. Under no circumstances are patients with quarantinable diseases treated at their homes.

The definite diagnosis of cases of an epidemic disease is secondary only in importance to a well-established inspection service; in fact, it is of equal importance in epidemiologic work. This is well provided for in Havana. All cases of illness of a suspicious nature are reported to the Director of Health, who at once convenes a legally appointed Commission of Infectious Diseases. This Commission consists of five members, including the Director of Health. The appointments are non-political and are based solely on professional standing.

In drawing its conclusions, so far as plague is concerned, the Commission depends on four factors, to wit: (1) clinical symptoms, (2) the microscopic examination of the body liquids, (3) cultures from these, and (4) results of inoculation of susceptible animals.

Since the first outbreak of plague in 1912, deratization has been constantly practised in Havana. Two weeks prior to the recognition of the first case in the present outbreak it was extensively carried on, owing to the reports of the finding of dead rats. The work has been pushed up to the present time, and all rodents caught or killed are examined for plague. Over seventy thousand rats have been examined since 1912, and only two found plague-infected, both during the present outbreak; the first, April 17, and the last, April 24.

Havana has the advantage that its buildings are to a great extent rat-proof in structure or can be easily made so. During the outbreak of plague in 1912 almost the entire commercial district was rat-proofed. This work is now being actively pushed whenever it is required, in the infected area or elsewhere.

In accordance with a recent order, a fine will be imposed on any person on whose premises rat-holes or runs are found.

The sewerage system of Havana is now practically completed, at a cost of £4,600,000, and was put in operation March 1, 1913.

A few of the former sewers in old Havana draining into the harbour are still used in part. They are closely connected with the main infected district and it is quite possible that they harbour rats; also the house connections are faulty. Of the 20,000 houses in Havana 5,000 have been examined.

The agents for this purpose are hydrocyanic acid gas, sulphur dioxide, phenoco, and a similar phenol disinfecting fluid, steam, and fire. In fumigation work hydrocyanic acid has given excellent results, and is preferred to sulphur dioxide. The method employed in its use is as follows:—

For every cubic metre of the space to be fumigated 20 grm. commercial potassium cyanide, 40 grm. crude sulphuric acid, and about 100 c.c. water. The potassium cyanide is divided into convenient parts, and each enclosed in three thicknesses of manila paper. A number of earthenware or, better, wooden vessels corresponding to the number of packages of potassium cyanide to be used are then provided and distributed about the building. Into these vessels is poured the aqueous solution of sulphuric acid. All openings having been closed except that of exit for the operators, the packages of potassium cyanide are thrown into the receptacles containing the sulphuric acid, the operators retreating towards the exit, which is sealed when the last receptacle is put in operation. The time of exposure varies from six to twelve hours, usually the latter.

The success of the operation without harmful results to the operators is based on the paper packages of potassium cyanide. As before stated, the chemical is protected by three layers of manila paper bagging, great care being taken that there are *no* holes in the paper, and by actual laboratory experiment it has been determined that from twenty to twenty-five minutes will elapse before the sulphuric acid solution destroys the paper envelope, and the chemical action begins setting free hydrocyanic acid gas.

The effects of hydrocyanic acid fumigation are striking. No living thing seems to escape its lethal action, while inanimate matter is left unscathed. Merchandise, silks and satins, metals, foodstuffs, none are in any way injured by its presence. It is an ideal substance for fumigation, when plague or yellow fever are concerned, but its germicidal power is weak.

For fumigating small spaces, such as rat-holes, the apparatus consists of a wooden box, 12 by 4 in., with a false bottom with two circular openings into which are inserted two 1,000 c.c. bottles with rubber stoppers, each perforated with two openings to permit the passage of the glass tubing connecting the two bottles, and each in turn to the rubber bulb and the outlet tube, to which, for convenience, a glass nozzle may be attached.

The bottle to which the rubber bulb is connected is charged with sulphuric acid diluted with two or three times its volume of water. The bottle to which the rubber tube and glass nozzle is attached is charged with powdered potassium cyanide. By means of pressure on the bulb the acid solution is forced into the bottle containing the cyanide. Chemical action is at once set up, and hydrocyanic acid gas rapidly evolved, passing out through the glass nozzle, which has been previously inserted into a rat-hole, the open

space around the nozzle having been sealed with a dash of cement mortar.

The box is fitted with a movable handle which serves several purposes, to wit: (1) convenience in carrying about, (2) facilitates the removal of the bottles for recharging, and (3) serves as a rest for the exit tube in order to avoid kinks and the consequent interference with the escape of the gas.

The apparatus may be made of any convenient size. For small rat-holes the size described above is used; for larger holes bottles having a capacity of 5,000 c.c. are employed. In the larger size the air tube is attached to a bicycle pump instead of the rubber bulb.

The small apparatus is charged with 150 grm. of powdered commercial potassium cyanide and about 300 grm. of crude sulphuric acid, diluted with three times its weight of water. This is calculated to yield 10 c.m. of 1·6 per cent. hydrocyanic acid gas. In a confined space the percentage of hydrocyanic acid gas will be materially increased.

Sulphur dioxide is used principally for fumigating sewers and for the purpose of determining their connections with rat runs and caves. Steam is employed in the disinfection of bedding and clothing, &c., at hospital.

Phenol disinfecting fluid is utilized for washing floors, walls, &c. The germicidal power of phenoco has been standardized according to the methods employed by the U.S. Public Health Service and found to be from fifteen to sixteen times stronger than phenol (carbolic acid).

The *modus operandi* in the disinfection of a building is as follows:—

(1) Fumigation with hydrocyanic acid gas.

(2) Diligent search for rat-holes, which when found are fumigated with hydrocyanic acid with Dr. Robert's apparatus.

(3) Tracing rat-holes, for which purpose, if necessary, floors and walls are removed and opened.

(4) Washing floors and walls with phenol disinfecting fluids.

(5) Inundation with mild solution of a phenol disinfectant.

(6) Rat-proofing.

It is interesting to note that no secondary cases have occurred after the disinfection of a locality.

One of the most striking features of the anti-plague campaign has been the depopulation of seventeen blocks, in the centre of the commercial district of the city, and the throwing of a military cordon about this zone, within which were located the two principal foci of infection. The depopulation was carried out under the authority of a section of the sanitary code which empowers the health authorities to close any house, building, or establishment which is considered dangerous to the public health.

The depopulation was practically completed within twenty-four hours. Nothing was removed from the zone.

The entire zone was then disinfected block by block, including the sewers connected therewith, beginning at the point furthest from the harbour and advancing towards the water front. The portion between the lower end of the zone and the wharves was also fumigated. All buildings not rat-proof were made so. Three weeks elapsed before the "zone" was opened up and the inhabitants allowed to return.

No restrictions were placed on personal travel. Coastwise vessels are fumigated at Havana and all freight capable of harbouring rats fumigated, except such freight as might be certified as coming from interior non-infected points and loaded directly from a rat-proof wharf.

Vessels leaving for foreign ports are fumigated for rats by the Cuban authorities on request. The Cuban quarantine regulations require the fumigation of all vessels that have docked at Havana and are bound for Cuban ports. Such vessels are fumigated in the stream immediately before sailing. Hydrocyanic acid gas is used for this purpose with excellent results. Vessels bound for the United States via Cuban or foreign ports are fumigated with sulphur by the Cuban authorities, under the supervision of the U.S. Public Health Service, and a certificate to that effect is issued.

All the cases were of the bubonic type with the exception of Case 5, in which the *Bacillus pestis* was found in the blood, no glandular enlargement being apparent. The case ended fatally within forty-eight hours. Of the bubonic cases all were of the femoral or inguinal variety save two in which the axillary glands were involved. In one of the latter cases the axillary bubo was followed by involvement of the cervical glands near the angle of the jaw, and, strange to say, of the opposite side. This case terminated fatally within seventy-two hours. In one case, No. 11, the initial bubo appeared in the glands above Poupart's ligament.

In the remaining twenty-four cases the bubo first appeared in the femoral region. Later, however, as the disease progressed, the inguinal glands above Poupart's ligament became involved, and in the majority of the cases the surrounding cellular tissues showed distinct signs of inflammation. As a rule the buboes were very painful and tender to the touch. With two exceptions the buboes suppurated and were opened, the healing process thereafter being long and tedious. There have been no cases of pneumonic plague.

In some of the first cases a dissociation between the pulse and temperature, such as occurs in yellow fever, was observed. A study of the entire series of cases shows, however, that this symptom is not at all constant. Albuminuria was present in all the cases. The amount of albumin was greater than that found in the hyperpyrexia of typhoid and malarial fevers, and the presence of epithelial casts shows that the kidney is seriously involved. The amount of albumin, however, never even approaches that found in yellow fever, with the same febrile movement, that is from 39·5° to 40·5° C. (103.1° to 104·9° F.).

As in other acute infectious diseases, plague may manifest itself in a very mild form, and may be

entirely overlooked unless all means at command are exhausted before determining the diagnosis. In two cases it was only by painstaking inoculation and cultural tests that the true nature of the disease was finally established.

The treatment has consisted of intravenous administration of massive doses of Yersin serum, 80 c.c. being administered twice daily during the first three or four days of the disease, or in fact so long as the temperature remains above 39° C. (102·2° F.), the doses diminishing gradually as the temperature falls. Over 500 c.c. of Yersin serum have been administered to one patient in divided doses. The height of the temperature is the guide for the quantity and frequency of serum administration. After suppuration has occurred, and the temperature is wholly or in part due to this process, the fever no longer serves as a guide, and in fact it is found better then to stop the serum altogether. The ill effects of these large doses of serum are counteracted by the administration of calcium chloride, 1 or 2 grm. daily.

This treatment has given excellent results, as the case mortality is but 22·2 per cent.

Other general symptoms are treated as they arise: depression by stimulants, principally strychnine; irritability and other cerebral symptoms, by anodynes, particularly drop doses of tincture of opium; diminished renal activity, byhexamethy lenamin. Warm, wet applications are applied to the bubo, which is opened so soon as suppuration is apparent.

Conclusions.

(1) That plague, like other epidemic diseases, may be controlled and eradicated with comparative ease if the health authorities are given the necessary legal and financial power to carry out sanitary measures.

(2) That in antiplague work passenger traffic need not be interfered with. In other words, the human plague case is a negligible factor in a well-organized antiplague campaign.

(3) That the measures adopted by the U.S. Public Health Service to prevent the introduction of plague from Havana into the United States were effective.

(4) That the intravenous administration of large doses of Yersin serum during the active infective period of the disease seems to be the best mode of treatment known to us at present.

THE TREATMENT OF SUPPURATION BY PUS INOCULATIONS, AND THE TREATMENT OF PNEUMONIA BY SUBCUTANEOUS INJECTIONS OF THE PATIENT'S OWN BLOOD.[1]

By V. Nesfield, F.R.C.S.

Wipe the interior of a 1-oz. wide-mouthed stoppered bottle with tinct. iodi., also wipe the stopper. Now rinse out with 1 in 50 carbolic.

Collect the pus in this, and add an equal volume of 1 in 50 carbolic acid, put in a piece of camphor, put on the stopper and put in a box (empty biscuit box) in a cool place. This must not be used before twenty-four hours to allow the organisms to be killed by the 1 in 100 carbolic acid and camphor.

There is not the smallest necessity to take cultures.

The Dose.—First day 2 mins., second day 3 mins., third day 4 mins., and so on daily, till 17 mins. have been given.

If required 10 min. doses can be given after this on alternate days.

Prophylactic dose 5 mins.

The Reaction.—It is quite ordinary to get induration at the site of injection, and for the temperature to rise 1° or 2°. This should not be feared. No abscess was formed in over 1,000 injections of the pus.

Special Syringe for Injecting Pus or other Vaccines.—This is simply a modified pipette. It consists of a graduated glass barrel brought to a point which is ground to take an ordinary hypodermic needle. There is a stout teat on the other end. The dose is sucked up, and the teat allowed to expand; the needle is introduced and the contents expelled by pressure on the teat. Nothing could be simpler, and as there is no plunger the syringe is very easily cleaned. The syringe can be sterilized by boiling, but the simplest method is to suck up a little tinct. iodi., squirt it out, and then suck up 1 in 40 carbolic (to neutralize the iodine) and squirt it out again. The pus bottle is opened to take out a dose. Should a stray organism fall in it perishes in twenty-four hours on account of the carbolic and camphor.

Prophylactic Inoculation.—As a prophylactic in cases of compound fracture and in injuries where suppuration is expected 5 mins. of stock pus is injected. This is also given in certain cataract cases, abdominal sections, and operations on cancer.

Types of Cases in which this Method has been used.—Histories are given of:—

(1) Abscesses, especially deep ones.
(2) Septic wounds.
(3) Compound fractures.
(4) Mastoid disease and osteomyelitis.
(5) After amputation of a gangrenous limb, or fungating cancer of the breast, &c. In these cases the initial dose is 5 mins., worked up daily to 17 mins.

An attempt is made to abort the pneumonia, and this often succeeds, by means of the following mixture:—

Sodii citras	gr. xxx
Liq. ammon. acet.	ʒiv
Spt. ætheris nitrosi	ʒi
Magnesium sulphate..	ʒi
Aqua	℥i
Every three hours.	
Also quin. sulph.	gr. x t.d.s.

If the disease continues on the third or fourth day an attempt is made to raise the antibodies and introduce [illegible] into the system.

This is done in the following way:—

If there happens to be a patient who has just recovered from pneumonia 5 c.c. of his blood is injected. If not, a stout vaccine syringe needle is inserted

[1] Abstracted from the *Indian Medical Gazette*, December, 1914.

into a distended median basilic vein, and from 2 oz. to 6 oz. of blood is allowed to flow out, depending on the state of venous congestion. The barrel of the syringe is then fitted on to the needle and 5 c.c. of blood drawn up. The needle is withdrawn from the lumen of the vein, thrust under the skin of the upper arm, and the blood injected ; the needle is withdrawn and a bandage applied, the blood clots, setting free alexin and some antibodies, and probably toxins.

The immediate effect of the venesection is to produce some relief. Usually there is a rise of temperature of 1° F. which can be controlled, if necessary, by sponging. The following day the temperature usually falls, and the decline continues 1° or 2° daily ; or there may be a crisis.

Nine cases of pneumonia were treated in this way without a death.

A malignant growth, carcinoma of the breast, was inoculated in 1912 ; the recurrence was in the opposite breast. The growth is cut up as small as possible with scissors, and this is then mixed with sand and pounded up with 1 in 100 carbolic acid.

It is allowed to sediment for six hours, the supernatant fluid and tumour emulsion is pipetted off, placed in a sterile bottle and camphor added. The doses were 20 mins. every second day.

In not a single instance has the inoculation done harm, while, on the contrary, every case has been improved where pus has been evacuated. Some of the results were truly marvellous, and have changed my outlook on surgery.

With pus vaccination limbs with a foul compound fracture are saved, provided the patient can move the fingers or toes. Instead of large incisions and drainage tubes in abscesses, the pus is evacuated, the cavity washed out, iodoform emulsion introduced, and the wound sewn up.

Notes and News.

LIABILITY FOR CAUSING MALARIAL FEVER.

According to the *Journal of the American Medical Association*, the Supreme Court of North Carolina has affirmed a judgment in the plaintiff's favour, in Rice *v.* Norfolk Southern Railroad Co., for damages alleged to have been due to the defendant having negligently permitted one of its drains to become clogged, ponding water under the plaintiff's house, with the result, as witnesses testified, of causing his children, aged, respectively, 13, 15, and 18 years, to have malarial fever. The Court says that there was evidence of the cost of the physician's bill and medicine and of the plaintiff's loss of the services of his children. There was also the testimony of the physician that the ponded water bred mosquitoes whose bite caused malaria. It is now the accepted doctrine of the medical profession that malaria is transmitted by the bite of a certain kind of mosquito, *Anopheles*, and that these mosquitoes are bred in standing water. True, counsel for the defendant expressed his belief that these mosquitoes were only bred in running water, and doubted the correctness of the doctrine that malaria was transmitted by their bite; but there was the testimony of the physician to that effect, and the trial court properly left the matter, being one of fact on the testimony, to the jury. Indeed, there was no evidence to the contrary.

Personal Notes.

India Office.

From October 28, 1914, to January 26, 1915.

Arrivals Reported in London.—Major F. S. C. Thompson, I.M.S.; Captain J. D. Sandes, I.M.S.; Captain J. D. Sanders, I.M.S.; Lieutenant-Colonel A. W. Dawson, I.M.S.; Major W. H. Cox, I.M.S.; Captain M. R. C. McWatters, I.M.S.; Major V. E. H. Lindesay, I.M.S.; Assistant-Surgeon C. W. Dunlop, I.S.M.D.

Extensions of Leave.—Major W. H. Cox, I.M.S., 3 m., M.C.; Lieutenant-Colonel H. B. Melville, I.M.S., 6 m., M.C.; Lieutenant-Colonel F. W. Gee, I.M.S., 4 m.

Permitted to Return.—Captain A. N. Thomas, I.M.S.; Lieutenant-Colonel R. J. Macnamara, I.M.S.; Major W. H. Leonard, I.M.S.; Lieutenant-Colonel F. W. Gee, I.M.S., 4 m.

List of Indian Military Officers on Leave.

Showing the Name, Regiment or Department, and the Period for which the Leave was granted.

Gee, Lieutenant-Colonel F. W., I.M.S., to April 22, 1915.
Leonard, Major W. H., I.M.S., to January 16, 1915.
Little, Captain G. L. C., I.M.S., to November 15, 1914.
McWatters, Captain M. R. C., I.M.S.
Wilson, Lieutenant J. D., I.M.S., to March 16, 1915.
Younan, Lieutenant-Colonel A. C., I.M.S., to December 31, 1914.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and date from, which the Leave was granted.

Cox, Major W. H., D.S.O., I.M.S., Burma, 21 m., April 12, 1913.
Drake-Brockman, Lieutenant-Colonel V. G., I.M.S., India Foreign Dept., 9 m., 13 d., May 1, 1914.
Dunn, Captain C. L., I.M.S., U.P. Sanitary Comm., 14m., November 4, 1913.
Elliot, Lieutenant-Colonel R. H., I.M.S., M., 24 m., April 19, 1913.
Harrison, Major C. B., I.M.S., Ms., 12 m., June 7, 1914.
Hunter, Captain J. B. D., I.M.S., 19 m., January 14, 1913.
Justice, Major W. A., I.M.S., Ms.
Masson, Major J., I.M.S., Bihar and Orissa, 15 m., August 13, 1914.
Matson, Captain H. S., I.M.S., Burma.
Melville, Lieutenant-Colonel H. B., I.M.S., Delhi, 7 m., April 1, 1914.
Miller, Major A., I.M.S., M.S.
Morgan, Major E. J., I.M.S., U.P., 18 m., October 1, 1913.
Nutt, Major H. R., I.M.S., U.P., 11 m., March 31, 1914.
Richardson, Major W. G., I.M.S.
Robb, Major J. J., I.M.S., Ms. Jails Dept.
Sandes, Captain J. D., I.M.S., Bl.
Thompson, Major F. S. C., I.M.S., Bl. Jails, 12 m., 25 d., September 19, 1914.
Webster, Major C. G., I.M.S., M. Hospitals, 24 m., July 29, 1913.
Wilkinson, Lieutenant-Colonel E., I.M.S., Punj. Sanitary Comm., 21 m., February 13, 1913.

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PLATE I.

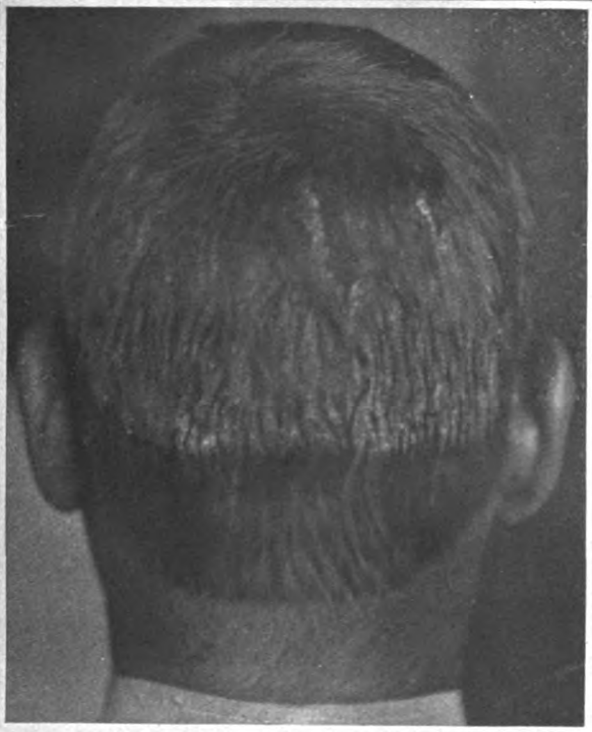

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

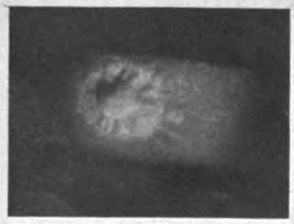

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

To illustrate paper, "Tinea Capitis Tropicalis in an Egyptian Soldier caused by *Trichophyton discoides* Sabouraud 1909," by Albert J. Chalmers, M.D., F.R.C.S., D.P.H., *Director, Wellcome Tropical Research Laboratories,* and Alexander Marshall, *Senior Bacteriological Laboratory Assistant, Khartoum.*

PLATE II.

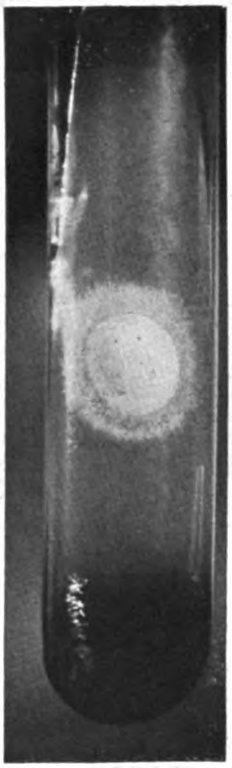

Fig. 10.

Fig. 11.

Fig. 12.

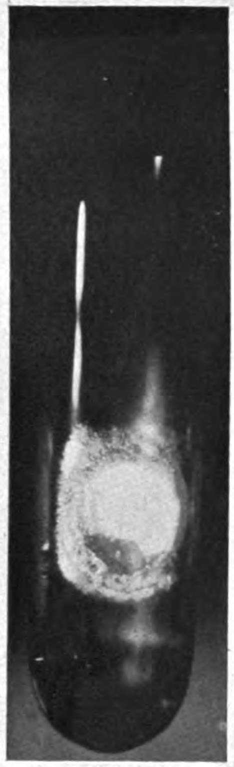

Fig. 13.

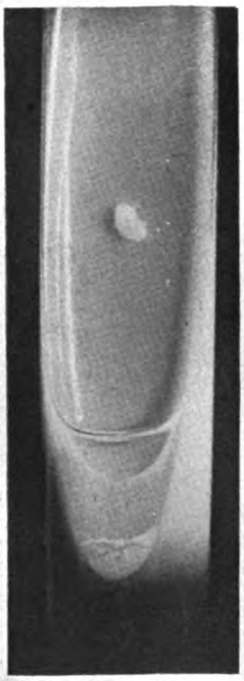

Fig. 14.

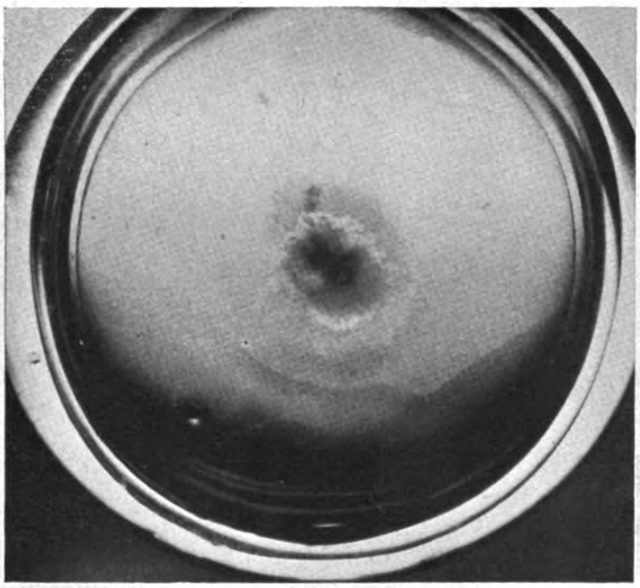

Fig. 15.

Fig. 16.

To illustrate paper, "Tinea Capitis Tropicalis in an Egyptian Soldier caused by *Trichophyton discoides* Sabouraud 1909," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., *Director, Wellcome Tropical Research Laboratories*, and ALEXANDER MARSHALL, *Senior Bacteriolcgical Laboratory Assistant, Khartoum.*

PLATE III.

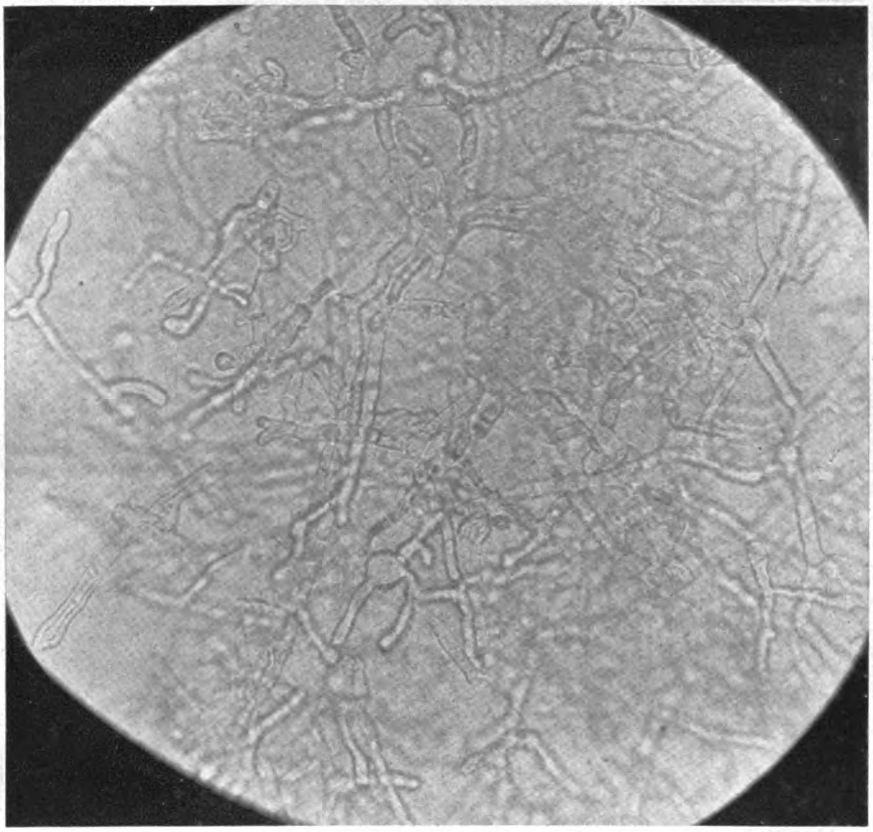

Fig. 17.

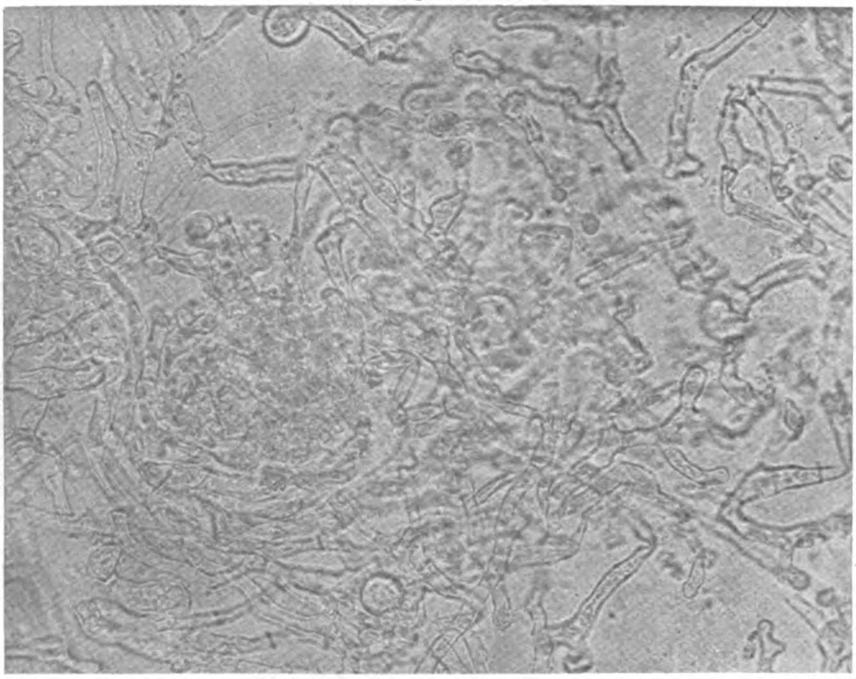

Fig. 18.

To illustrate paper, "Tinea Capitis Tropicalis in an Egyptian Soldier caused by *Trichophyton discoidès* Sabouraud 1909," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., *Director, Wellcome Tropical Research Laboratories,* and ALEXANDER MARSHALL, *Senior Bacteriological Laboratory Assistant, Khartoum.*

Original Communications.

TINEA CAPITIS TROPICALIS IN AN EGYPTIAN SOLDIER CAUSED BY *TRICHOPHYTON DISCOIDES* SABOURAUD 1909.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.

AND

Alexander Marshall.
Senior Bacteriological Laboratory Assistant, Khartoum.

Introductory.—This is the third of a series of short notes[1] on the subject of *tinea capitis tropicalis* as seen in the Anglo-Egyptian Sudan.

In the first we gave a history of ringworm in the tropics and described a new form of ringworm of the head caused by *Trichophyton currii* Chalmers and Marshall 1914.

In the second we discussed the systemic position of Malmsten's genus *Trichophyton* as viewed by us in the light of the knowledge we had acquired by the study of certain peculiar phases of the life-cycle of *T. currii.*

In the present paper we propose to consider a form of tinea capitis tropicalis caused by *T. discoides* Sabouraud 1909.

This fungus belongs to Sabouraud's *Ecto-endothrix* division of the genus *Trichophyton*, which is divided by the same author into the subdivisions *Microïdes* and *Megaspores*, which for sake of uniformity we will call *Microsporoides* and *Megasporoides*. The Megasporoides are further classified in two groups according to the appearance of the cultures. These two groups are characterized by either the early appearance of a duvet or by a growth resembling that of *Achorion schoenleini.* This last group comprises the *faviform trichophytons* of Bodin, among which *T. discoides* is classified.

In this paper we record for the first time the presence of this fungus in the tropics, in Egypt and in the Anglo-Egyptian Sudan. We therefore feel justified in bringing forward such information as we have been able to collect concerning *T. discoides*, and will commence with a history of the faviform fungi in general

Historical. — The faviform trichophytons were discovered in Paris by Sabouraud in 1893, who found that the cultures of a trichophyton belonging to the Megasporoides subdivision of the division Ecto-endothrix, and derived from a case of tinea capitis in a child aged about 10, developed little by little the same characters as those produced by a culture of *Achorion schoenleini* (Lebert, 1845).

At this time Sabouraud was fully occupied with the controversy over the plurality of the species of trichophyton, and was unable, at the moment, to pursue the subject of these cultures any further. He therefore gave them to Bodin, who was, at that time, studying human favus and who carried on the investigations with great success as we shall presently note.

Three years later, in 1896, Fox and Blaxall found a faviform fungus on a dog in England, and in the same year Ducrey and Reale obtained another from a calf near Rome.

At the same time Bodin published his celebrated "Thèse de Paris" on "Les teignes tondantes du cheval et leurs inoculations humaines," in which he described a ringworm epidemic lasting three months and infecting all the horses of a stable at Clichy-Levallois, which was due to the introduction of one infected horse brought from Denmark. This disease spread to man, infecting in all nine persons. The microscopical appearances were those of Ecto-endothrix, but the cultures resembled those of an Achorion, and therefore he used the term *faviform trichophyton* to denominate this type of fungus.

He also described a similar eruption on an ass which infected four persons, and which was due to a faviform trichophyton very closely allied to the above.

In July, 1896, he read an article before the Society of Biology, entitled, "Sur les favus à lesions trichophytoides," in which he described a trichophyton found in a calf which closely resembled that found in the horse.

In 1898 he wrote a paper on the fungi intermediate between the genera *Achorion* and *Trichophyton.*

In 1901, Bunch in his paper, "On Ringworm Infections in Man and Animals," described a faviform trichophyton in birds, and later in the same year MacLeod found one in a patch of tinea circinata on the wrist of a child who looked after two tame canaries. No cultures could be obtained from the infected stumps of the feathers of the canaries, but a peculiar gelatinous faviform growth was obtained from a scraping from the border of the patch on the boy's wrist. These two papers established the presence of these fungi in birds and the possibility of the infection of man therefrom.

In the same year Plaut, in the first edition of Kolle and Wassermann's "Handbuch der pathogenen Mikroorganismen," described a faviform fungus resembling that found by Bodin in horses, but differing therefrom in the cultures being snow-white instead of greyish-brown.

In 1902 Bodin published his work "Les champignons parasites de l'homme," in which he gave an account of these fungi, naming the species described by him in the ass and man *Trichophyton verrucosum* Bodin 1902.

About the year 1906 Krystallowicz privately informed Sabouraud that he had found the same fungi in cases of ringworm in Cracow and later published a work on the trichophytons, microsporums, and Achorions found in that town.

In 1909 Sabouraud published a paper entitled "Les Trichophytons faviformes," in which he gave a full account of these fungi and named three species, viz., *T. ochraceum*, *T. album* and *T. discoides.*

[1] The two preceding articles in the series will be found in the Journal of Tropical Medicine and Hygiene, 1914, xvii, pp. 257 and 289, under the titles of "Tinea Capitis Tropicalis in the Anglo-Egyptian Sudan," and "The Systemic Position of the Genus *Trichophyton*, Malmsten, 1845."

In the same year Dalla Favera reported that he had discovered faviform fungi fourteen times in 144 cases of ringworm examined in the Province of Parma, and in the same year Horta announced that he had isolated *T. album* from two cases of ringworm in men in Brazil and from eighty bovines which were attended by these men. This is the first occasion on which a faviform trichophyton was found in the tropics. Vasconcellos has also found this parasite in a bull in Brazil.

In 1910 Sabouraud gave a masterly summary of the whole subject in his magnificent monograph "Les teignes," including an account of two cases of infection with *T. discoides*, one in a slaughterhouse man, presumably infected by cattle, and the other in a woman.

In 1911, Bang in Denmark reported that he had found *T. discoides* three times in the scalp of children, once in the beard of a man, twice in the so-called glabrous skin of adults, and that he had traced the infection of all these cases to one source, viz., an infected horse. We have been unable to refer to Bang's original paper, and are therefore not in a position to state whether he described the appearances of this fungus or not, as the summary before us merely records his finding the parasite.

Brault and Viguier quote Knopp as having published a thesis in which he reported the presence in Algiers of *T. verrucosum* Bodin.

In the same year Whitfield described a trichophyton ecto-endothrix causing tinea tonsurans in England, which clinically produced reddening of the skin, silver scaling and many hair-stumps. The mycelial elements were very large and oval and arranged in chains both external to the hair and inside the shaft. The cultures were somewhat ochraceous, very flat lying and only slightly powdered. The species of trichophyton was not identified.

In 1914 Brault and Viguier summarized their researches into the ringworms found in Algiers from 1912-14, stating, among other matters, that they have found trichophytons, with faviform cultures in cases of kerion, but they did not name them, and it is not clear that the new species *T. luxurians*, which they simply mention as an *ectothrix* producing a kerion, has a faviform culture or not.

It will thus be observed that though the faviform trichophytons have been reported many times, but few authors have named the species which they have found or have described them sufficiently fully to justify other authors applying a name to them.

The position of the faviform trichophytons at the present time may be summarized by stating that:—

a) Named and unnamed species have been recorded as naturally occurring in man, in bovines, orses and birds.

(*b*) The named species are:—

(1) *T. verrucosum* Bodin 1902.
(2) *T. ochraceum* Sabouraud 1909.
(3) *T. album* Sabouraud 1909.
(4) *T. discoides* Sabouraud 1909.

Sabouraud is inclined to think that *T. ochraceum* is the same as *T. verrucosum*, but this view is not generally accepted at present.

The named species are distributed geographically as follows:—

T. verrucosum: Found in four people in France and also in Algiers, and reported in the ass and the dog.

T. ochraceum: Found some six times in France in man.

T. album: Found in man in one case in France and in two cases in Brazil, in which country it attacked eighty head of cattle, avoiding however the calves.

T. discoides: Found nine times in man in France and Denmark, and also once in a horse.

To this history we now add for the first time the presence of *T. discoides* Sabouraud 1909 in the Tropics.

Geographical Distribution.—As far as we know *T. discoides* has only been found in France and Denmark.

We now report a case found in the Anglo-Egyptian Sudan which may have been originally infected at Sandamanhor in the Zagazig Province of the Delta of the Nile, because our case was an Egyptian recruit from that district.

Zoological Distribution.—*T. discoides* has been known to occur in men and horses. Our case may have been infected from cattle or donkeys. One of Sabouraud's cases probably came from cattle and Bang's cases from a horse.

Racial Distribution.—In man *T. discoides* has been found in the French and in the Danes, and now we report it in an Egyptian fellah.

Bodily Distribution.—*T. discoides* has been found three times in the scalp causing tinea capitis, twice in the beard producing sycosis, and twice in the so-called glabrous skin giving rise to an eczematous condition. Our case was one of tinea capitis.

Ætiology.—When an affected hair is removed, it is seen to be surrounded by a whitish sheath, and when this is examined microscopically, and in an early stage, it is seen to contain the branched mycelium and chains of spores of a trichophyton of the Ectothrix variety. In a later stage of invasion, in place of hyphæ large masses of doubly contoured spores may be seen on the outside of the hair-shaft. These spores, according to our measurements, vary from 4·6 to 5·8 microns in transverse diameter, while Sabouraud gives the measurement in his cases as from 5 to 7 microns in diameter. In still older infections we have observed in the hair-shaft, along with a few fragments of mycelium and some spores, air bubbles, thereby causing a resemblance of the hair to that of a case of favus and to a certain extent to fig. 184 of Sabouraud's "Les teignes."

In studying this fungus we have used the same technique in staining and in obtaining pure cultures as in the first paper.

T. discoides grows well at 20° C. and at 30° C., but not so well at 40° C., while it does not grow under anaerobic conditions.

The following are the results which we have obtained by cultivation in various media:—

Liquid Media.—In glucose peptone and in beer-wort it grew into puff-balls composed of hyphæ and chlamydospores. In litmus milk it formed a skin on

the surface in which it grew, but did not alter the colour of the blue litmus. Below this skin it eventually gave rise to a brownish solution with a deposit at the bottom of the tube.

It grew well in sugary, starchy and alcoholic peptone media, but formed neither acid nor gas at the end of a week in the following: *Monosaccharides:* glucose, lævulose, mannose, galactose, arabinose and xylose; *Disaccharides:* lactose, maltose, saccharose and amygdalin; *Trisaccharide:* raffinose; *Polysaccharides:* dextrin, inulin, starch and glycogen; *Glucosides:* salicin, helicin and phlorrhizin; *Alcohols: Trihydric*—glycerin; *Tetrahydric*—erythrite; *Pentahydric:* adonite; *Hexahydric:* dulcite, mannite and inosite. Control tubes were used in all cases.

Sabouraud's Maltose Agar.—On the third day at 32° C., or the fifth day at 23° C., the growth appears as a small yellowish-brown humid hillock covered with little projections of the same colour. At this stage there is no sign of the white plateau or fringe which surrounds the hillock later on (fig. 3).

On the eighth day, at 32° C., the central yellowish-brown hillock is very definitely seen situate on a yellowish-brown convex elevated plateau, from which it is delineated by a slight groove, the whole being surrounded by a poorly marked fringe, *vide* fig. 5, which may be compared with an exactly similar culture grown at 23° C., and depicted in fig. 4. Once when grown, after many subcultures had been made, on the same medium at 23° C. we noticed a slight depression in place of the hillock on the plateau.

On the nineteenth day at 32° C. the central knob is well defined and the plateau is marked with creases, while the fringe is only poorly developed (fig. 6). On the forty-second day at 32° C. the grooves on the plateau have extended and deepened and invaded the central hillock, thus producing a cerebriform appearance, while the whole is still surrounded by a slight white fringe (fig. 7). At this stage it shows a remarkable resemblance to the growths of *Achorion schoenleini* (Lebert, 1845), and to a less extent to old growths of *Trichophyton album* as depicted by Sabouraud.

Sabouraud's Glucose Agar.—On this medium after five days at 32° C. the growth appears as a smooth, glabrous, humid, yellowish-brown cupola surrounded by a radiating fringe (fig. 10), but the growth at 32° C. in the dark was so rapid that a few days later it met with the sides of the tube and lost its typical appearance. Figs 11 and 12 show similar cultures grown at 23° C., but these will be referred to below under the heading "Factors influencing the Growth of Cultures."

Sabouraud's Maltose Gelatine.—It grew relatively slowly on this medium at 20° C., producing, however, a typical brown convex cupola-like centre (fig. 13) which is shining, humid and glabrous. Around this is a whitish depressed area sunk into the medium through liquefaction, and around this again a radiating fringe.

The gelatine slowly liquefies, apparently in the region of the white area immediately around the cupola. Fig. 15 attempts to depict the sinking of the growth into the medium owing to the liquefaction, while fig. 13 shows that the whole growth has slipped down the tube from the same cause. It may, perhaps, be as well to mention that control tubes showed no liquefaction.

Sabouraud's Glucose Gelatine.—The growth on this medium resembles that on Sabouraud's maltose gelatine, a yellowish brown, humid, glabrous cupola-shaped centre being surrounded by a depressed area covered by a white growth and surrounded by a white fringe which extends on to the medium beyond the depression, and, as in the maltose gelatine, there is liquefaction, which did not occur in control tubes.

Blood Serum.—On this medium at 32° C. it formed a central white hillock in three days (fig. 14), which later became surrounded by a white plateau and a radiation. On this medium there were early signs of a duveteuse condition arising.

Potato.—The fungus grew readily at 32° C., producing an indented elevation covered with a white duvet and without any radiation (fig. 16).

Factors influencing the Growth of Cultures.—We have always found that air temperatures are the best for the cultivation of the achorions, microsporums, and trichophytons, which we have met with.

In Khartoum, however, the air shade temperature varies from 47° C. (116° F.) to 9° C. (48° F.).

In the cool (not cold) incubators in the laboratory the temperature is about 23° C. (73·4° F.) during the winter, and on an average about 32° C. (89·6° F.), though it is a little higher at times, during the summer; but the air temperature in the laboratory itself is much higher than this in the summer. During this latter season we have noticed that the cultures grow very rapidly—and, in fact, it would appear as though five days' growth was sometimes equivalent to more than one month's growth in Paris—while during the former season the growths are more comparable with those of Paris.

This point is demonstrated by a comparison of the growth of *T. discoides* for eight days on maltose agar at 32° C., as depicted in fig. 5, with a similar growth at 23° C., as shown in fig. 4.

Air temperatures are, however, not the only factor, as will be seen if fig. 8 is compared with fig. 12. Both of these growths were inoculated into their respective media from the same culture on the same day, and within a few minutes of one another. Fig. 8 represents the growth on Sabouraud's maltose agar, and fig. 12 that on Sabouraud's glucose agar. The only difference here, as far as we know, is the nature of the sugar, as the media were made by the same person, from the same materials, except the sugars, and about the same time, and were under the same conditions as to humidity.

As our cultures are always grown in the dark, and, when examined, are all exposed to the light for a similar length of time, the effect of light may be excluded. As they were both grown in test tubes of the same make, stoppered with cotton-wool from the same packet, and capped with red india-rubber caps of the same batch from the agents, it is not obvious what factor has caused the difference in the

growths of the cultures unless it is the difference in the sugars. Even this will not explain the differences depicted in figs. 8 and 9, which are inoculations from the same culture, on the same day, grown on the same medium, and at the same temperature.

Another point of interest is that, after repeated subculturing, *T. discoides* shows a tendency to alter the character of its growth and to become more achorion-like in character.

Microscopical Examination of the Cultures.—We were much struck by reading what Sabouraud writes about the mycology of *T. discoides*, to which he only refers in a footnote on p. 652 of his "Les teignes." His words are:—

"Nous n'avons étudié la mycologie du *Tr. faviforme discoïdes* que par dilacération. Nous n'y avons observé que les mêmes formes présentées par les autres trichophytons faviformes et étudiées avec eux. Aussi ne lui consacrerons-nous pas d'article mycologique spécial."

We are equally impressed by the paucity of the results we have obtained from the examination of a large number of cultures grown on different media at varying temperatures, even when one of them was kept for upwards of six months on maltose gelatine at temperatures varying from 20° C. to 10° C., which is equivalent to a much longer period in Paris. In this old culture there were signs of degeneration in all the hyphæ, while the chlamydospores were lying isolated. We have only observed the branching hyphæ of the mycelium and the intercalary chlamydospores more or less as depicted in figs. 17 and 18, with the sole exception that once in the growth on maltose agar of nineteen days' duration, shown in fig. 6, we observed some agglomeration of hyphæ depicted in fig. 18.

This body is not unlike that illustrated by Sabouraud in fig. 406 on p. 703 of his work, "Les teignes," under the heading of the mycology of *Achorion schoenleini.*

This body, which Sabouraud describes as "Organe de fonction inconnue observée à la périphérie d'une culture d'achorion très active (7e jour), obj. $\frac{1}{12}$, ocul. 2, Leitz)" appears to us from the knowledge acquired by a study of *T. currii* probably to represent an abortive attempt to form a perithecium.

More researches on this subject are required, but, provisionally, it would appear to us, as far as our present knowledge goes, that these faviform trichophytons have become so accommodated to parasitic life that their organs of fructification are produced more rarely than is the case with other trichophytons, and in this we are in entire agreement with Sabouraud in his remarks on the mycology of *T. ochraceum*, where on p. 652 he says:—

"Jamais ces cultures ne montrent rien qui ressemble à une conidie externe, à une grappe, ou à un fuseau."

Animal Inoculations.—It is proposed to deal with this subject in a subsequent paper, as the results of our animal experiments were lost owing to the fact that we both became ill at the same time with laboratory infections.

Classification.—We have already shown in our second paper that there are good reasons for believing that the genus *Trichophyton* Malmsten 1845 belongs to the Class *Ascomycetes* De Bary 1866, and to the family *Gymnoascaceæ* Baranetzky 1872.

The present fungus belongs to the genus Trichophyton because:—

(1) It is parasitic around and in hairs, and in the skin of men.

(2) Its hyphal segments (so-called spores) are large—4·6 to 5·8 microns in diameter.

(3) Its cultures resemble those of other trichophytons when young.

It belongs to that division of the genus *Trichophyton* which is called "ecto-endothrix" because the spores and hyphæ are first seen on the outside of the hair-shaft, though later they invade the interior, and because it caused suppuration.

This division of the genus is classified by Sabouraud into subdivisions, viz., Les Trichophytons ectothrix microïdes, or more simply *Trichophyton microsporoides*, and Les Trichophytons ectothrix mégaspores, or more simply *Trichophyton mégasporoides*, the former of which have often been confused with the microsporums.

The subdivision trichophyton microsporoides is defined as follows:—

Trichophyton ectothrix with small spores about 3 to 4 microns in diameter forming a sheath outside the hair-shaft, on dissociation of which they are seen to form chains; with sinuous and quadrangular hyphal segments together with spores of varying diameter and air bubbles inside the hair-shaft; with cultures easily obtainable, of rapid growth, and of considerable vitality, characterized by plaster-like or floury centres surrounded by a fringe, when grown on Sabouraud's proof media, and by successful inoculations into animals.

The ectothrix megasporoides may be defined as follows:—

Trichophyton ectothrix, with large spores about 5 to 7 microns in diameter, forming a sheath outside the hair-shaft, on dissociation of which they are seen to form chains and with sinuous hyphal segments, together with large-sized spores and air bubbles, inside the hair-shaft; with cultures easily obtainable, but of slow growth in temperate climates, though much more rapid in tropical climates, characterized by their tendency to resemble (at all events when old) those of the Achorions, and capable of being inoculated into animals.

The fungus which we are considering agrees with the definition of the ectothrix megasporoides group with the sole exception that we have not yet carried out animal inoculations, and it is easily separable from the ectothrix microsporoides group by the large size of the spores outside the hair-shaft as well as by the characters of its cultures.

Sabouraud divides the trichophytons ectothrix megasporoides into those characterized by the early formation of a duvet on the cultures—duveteuse megasporoides—and those distinguished by a culture which sooner or later resembles that of *Achorion schoenleini*—faviform megasporoides.

The fungus which we are considering does not form an early duvet, but, on the other hand, in old cultures it does resemble *A. schoenleini*, and therefore we classify it among the ectothrix faviform megasporoides.

The trichophytons which are at present known to belong to this group are:—

T. verrucosum Bodin 1902,
T. ochraceum Sabouraud 1909,
T. album Sabouraud 1909,
T. discoides Sabouraud 1909,

which may be differentiated as follows :—

(*A*) Condition of mycelium in hair not definitely stated :
- (1) Young cultures, white in colour and soon resembling those of *Achorion schoenleini*, but sunk into the medium ... ... *album.*

(*B*) Condition of mycelium in hair that of an ecto-endothrix :
- (2) Cultures grey in colour, humid, with verrucose surface ... ... *verrucosum.*
- (3) Young cultures of a yellow ochre colour ... ... *ochraceum.*
- (4) Cultures, yellowish-brown or greyish-yellow, cupola-shaped, humid, with usually smooth surfaces and not resembling the Achorion cultures until old ... ... *discoides.*

It is not unusual to describe *T. verrucosum* as a pure ectothrix, but Bodin distinctly says: "Le *Trichophyton verrucosum* qui, dans sa vie parasitaire est *endo-ectothrix* au niveau des poils malades," &c.

With regard to the fungus in question it is obvious that it does not belong to (*A*) because its condition in the hairs is definitely known to be that of an ecto-endothrix, which makes it come under the heading (*B*).

As its cultures are not grey and do not become verrucose till quite old, and only then rarely, it can be differentiated from *T. verrucosum*, and the fact that its young cultures are never yellow ochre in colour distinguishes it from *T. ochraceum*, while all its characters indicate that it is *T. discoides* Sabouraud 1909.

Relationships.—In our paper on the "Systemic Position of the Genus *Trichophyton*," we gave reasons for believing that it belonged to Baranetzky's family Gymnoascaceæ, and in our paper on *T. currii* we indicated by means of a phylogenetic diagram our views as to the phylogeny of the division "endothrix" as a whole and that of *T. currii* in particular.

T. discoides Sabouraud 1909 belongs to another division of the genus Trichophyton, entitled "ecto-endothrix," which appears to us to be more primitive than the Endothrix division because it causes inflammation and suppuration, and it mainly attacks the outside of the hair, while the endothrix trichophytons are more truly adapted to parasitic life in man in that they do not cause inflammation and suppuration.

Another point of interest is that the species of the ectothrix group are essentially parasites of animals and those of the endothrix group parasites of man.

Our views as to the phylogeny of *T. discoides* may be obtained from a study of the diagram depicted below.

We divide the main Trichophyton achorion stem into two principal branches, viz., the endothrix and the ectothrix-achorion. We join the achorions to the ectothrix-trichophyton group because in the size of their spores and in the appearance of their cultures they approach closely the *Ectothrix megasporoides* sub-group.

The main ectothrix-achorion stem appears to us soon to give off the ectothrix microsporoides group and then to proceed as the stem carrying the trichophyton ectothrix-megasporoides and achorions.

From this the ectothrix-duveteuse group first separates off as it is more like the trichophytons, and then the stem divides into the ectothrix-faviform group and the achorions.

With regard to the position of *T. discoides* in the ectothrix-faviform group, it appears to us to be more primitive than that of the other members as it is more trichophyton-like, and only in old cultures shows the faviform type of culture.

T. verrucosum and *T. ochraceum* are obviously nearly related to one another, while *T. album* has differentiated more nearly on the lines of the achorions.

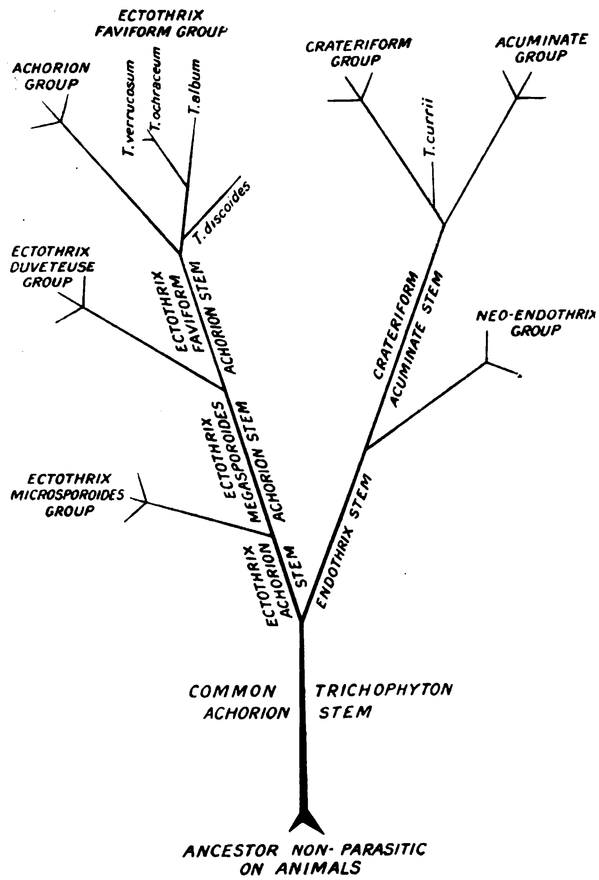

Diagram to show the possible relationships of *T. discoides* and *T. currii.*

Symptomatology.—The length of the incubation period is unknown, and the present patient was so dull mentally that he had no idea as to when or where the disease originated.

When first seen the eruption was well marked, covering an area of the scalp some 4 in. in length by 3 in. in antero-posterior measurements and situate at the back of the head (*vide* fig. 1).

When the area was examined it was observed that the hairs were matted together by yellow crusts,

which, when removed, showed that the skin of the scalp was red, angry-looking and swollen, soft, pitting on pressure, and exuding serum around the hairs, which were not broken off, but, on the contrary, were quite long and, as already mentioned, matted together by the coagulated serous exudate.

On removal of a hair it was observed to be surrounded by a white sheath, which, on microscopical examination, showed the spores and hyphæ of a fungus of the trichophyton ecto-endothrix megasporoides type, and which, on cultivation, proved to be *T. discoides* Sabouraud 1909.

The only symptoms noticed by the patient were itching and slight pain at times in the affected area, and these, he said, had only been present during the last few days before examination.

The glands at the back of the occiput were slightly swollen on both sides, but apart from this the recruit appeared to be in excellent health physically.

The head was shaved and the hair allowed to grow for a few days, when white scales appeared over the affected area on which the hair-shafts were growing normally and were not brittle; but serum was again observed to exude and to coagulate, thus tending to mat the hairs together. If one of these hairs was removed it showed the same sheath and parasite as indicated above, and if the scaly epidermis was scraped off it also could be observed to contain the same parasite.

No pus was present at any time, but the general appearance of the skin and of the hair follicles left no doubt in our minds that, if no treatment had been applied, a kerion would have resulted. The eruption, however, remained localized and did not spread either on the patient's body or to the other soldiers of the regiment.

The treatment mentioned below was now applied and a cure quickly effected.

Diagnosis.—The principal points to be observed for purposes of diagnosis are:—

(1) The presence of an area of inflamed, angry-looking, swollen skin which pits on pressure and in addition produces an exudate which coagulates into yellow masses, matting the hairs together. Possibly in other cases and in later stages pus might be found.

(2) The hairs on the affected area remain relatively long and are not brittle, but are matted together by the exudate.

(3) On removal of an affected hair it is seen to be surrounded by a white sheath, and on microscopical and cultural examinations is found to be infected by *T. discoides* Sabouraud 1909.

Differential Diagnosis.—The differential diagnosis has to be made from *feigned eruptions*, *favus*, the known forms of *tinea capitis tropicalis*, and the known forms of the *tinea capitis* of temperate climates not included under the heading "tropicalis."

From *feigned eruptions* it is easily diagnosed by the removal and subsequent microscopical and cultural examinations of a few affected hairs, when the characters already described above will indicate the presence of *T. discoides*.

From *favus* it is also easily differentiated by the absence of the typical yellow cup-like formations, though the impetiginoid phase of favic eruptions may be simulated by the yellow crusts. Finally it is recognized by microscopical and cultural examinations of the affected hairs and scales.

From the known forms of *tinea capitis tropicalis* it may be distinguished as follows:—

(1) From those caused by species of the genus *Microsporum* Gruby 1843 by the size of the so-called spores being large—4·6 to 5·8 microns or more in diameter.

(2) From those caused by species of the genus *Trichophyton* Malmsten 1845 it may be separated by:—

(*a*) The fact that the fungus is an ecto-endothrix in all the hairs, which character distinguishes from those varieties of tinea capitis tropicalis which are caused by the *endothrix* division. This is also supported by the presence of inflammation of the skin around the affected hairs, which character is usually absent in endothrix infections, though MacLeod has published a case of a kerion of the scalp caused by an endothrix, but this must be very rare.

(*b*) The fact that its spores are large separates it from a tinea capitis tropicalis caused by a species of the *Ectothrix microsporoides* group.

(*c*) No member of the *Ectothrix megasporoides* has so far been described as a cause of tinea capitis tropicalis, and only *T. ochraceum* and *T. discoides* as the cause of tinea capitis in temperate climates. The others have so far only been described in cases of sycosis and tinea circinata.

The characters of the only case caused by *T. ochraceum* were those of a commencing kerion, characterized by small follicular pustules, which distinguishes it readily from our case.

Should a tinea capitis infection in the others be found at any time, the present variety could be easily separated by microscopical and cultural examinations, even if the clinical features did not permit differentiation.

From the known forms of *tinea capitis* in temperate climates it can be separated by the same methods as those just indicated for tinea capitis tropicalis.

Prognosis.—Judging by our case the prognosis as regards baldness is good if treatment is carried out early.

Treatment.—The tobacco soap of T. Mentzel, of Bremen, used as a lather for the affected region very quickly effected a cure.

Prophylaxis.—The prompt diagnosis, isolation and treatment of a case prevent it spreading in a regiment, and if it is realized that as a rule the primary infection comes from an animal it is obvious that a search for and treatment of this primary cause are necessary to prevent more cases.

Acknowledgments.—We have much pleasure in acknowledging the help which Captain Drew, R.A.M.C., Senior Medical Officer of the Khartoum Egyptian Army District, has given us in this work.

ILLUSTRATIONS.

Most of these illustrations may, with advantage, be examined by means of a lens.

PLATE I.

Fig. 1.—Photograph of the back of the head of an Egyptian soldier, showing the eruption caused by *Trichophyton discoides* Sabouraud 1909.

Fig. 2.—Photograph of a black native Sudan burma made from porous fire-baked clay and supported on an iron tripod, which permits free circulation of air and allows the water in the interior to exude and evaporate. With an air shade temperature of 47° C. the temperature of the interior is about 20° C. to 22° C., and with one reaching only as high as 30° C. to 32° C. it is about 10° C. This is the cold incubator in which the gelatine cultures were grown.

Fig. 3.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after five days at 23° C. *Photograph.*

Fig. 4.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after eight days at 23° C. *Photograph.*

Fig. 5.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after eight days at 32° C. This culture is made on a watch-glass as described in the first paper, hence its clearness. *Photograph.*

Fig. 6.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after nineteen days at 32° C. *Photograph.* This illustration is placed sideways for purposes of spacing. The white to the right of the culture is the medium, which was slightly melted so as to allow the whole growth to be removed from the tube, after which it was photographed.

Fig. 7.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after forty-two days at 32° C. This culture is grown on a watch-glass. *Photograph.*

Fig. 8.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after thirteen days at 23° C., and inoculated at the same time as figs. 9 and 12. *Photograph.*

Fig. 9.—*Trichophyton discoides.* Growth on Sabouraud's maltose agar after sixteen days at 23° C., and inoculated at the same time as the growth depicted in fig. 8. It subsequently formed a similar growth to fig. 8, but took much longer to do so. *Photograph.*

PLATE II.

Fig. 10.—*Trichophyton discoides.* Growth on Sabouraud's glucose agar after five days at 32° C. *Photograph.*

Fig. 11.—*Trichophyton discoides.* Growth on Sabouraud's glucose agar after five days at 23° C. This photograph should be compared with fig. 10. *Photograph.*

Fig. 12.—*Trichophyton discoides.* Growth on Sabouraud's glucose agar after thirteen days at 23° C. This photograph should be compared with fig. 8, which represents a growth inoculated on the same day from the same culture and grown under similar conditions. *Photograph.*

Fig. 13.—*Trichophyton discoides.* Growth on Sabouraud's maltose gelatine after ten days at 20° C. The growth has slipped down the tube owing to the liquefaction of the gelatine. *Photograph.*

Fig. 14.—*Trichophyton discoides.* Growth on blood-serum after three days at 32° C. *Photograph.*

Fig. 15.—*Trichophyton discoides.* Growth on Sabouraud's maltose gelatine in a Kitasato flask after ten days at 20° C. Note the sinking of the growth into the medium owing to liquefaction, and also the liquid gelatine collected on the bottom of the flask. *Photograph.*

Fig. 16.—*Trichophyton discoides.* Growth on potato after five days at 32° C. *Photograph.*

PLATE III.

Fig. 17.—*Trichophyton discoides.* Branching hyphæ and chlamydospores from a culture. Fresh preparation. × 650 diameters. *Microphotograph.*

Fig. 18.—*Trichophyton discoides.* Branching hyphæ, chlamydospores and a peculiar body composed of a conglomeration of hyphæ, which may represent an abortive attempt at a perithecium. There were several of these conglomerations in the culture, which is depicted in fig. 6. Fresh preparation. × 700 diameters. *Microphotograph.*

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THE SO-CALLED PARASITE OF YELLOW FEVER.

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There are one or two points in Dr. Seidelin's reply[1] to our paper on "The Occurrence of Certain Structures in the Erythrocytes of Guinea-pigs and their relationship to the so-called Parasite of Yellow Fever" (Journal of Tropical Medicine and Hygiene, December 15, 1914) which call for some comment. Taking those points in the order in which they occur, we would first like to draw attention to his remarks upon the bodies occurring in newly born guinea-pigs. He rightly remarks that if those animals had not been examined till they were some days old they might have acquired a natural infection in that time. Unfortunately for this argument we were as well aware of this possibility as he, and when we stated newly born guinea-pigs we meant this literally, the blood being taken from some of the

[1] "Journal of Tropical Medicine and Hygiene," February 15, 1915.

animals when less than one hour old. It seems to us somewhat surprising that Seidelin's investigations have not led to the examination of these young animals, even if it were only to test the possibility of very young animals being more susceptible to the yellow fever virus.

It is not easy to understand what Seidelin means by the apparent lack of detail in our paper, but as this statement appears in connection with his question as to the age of the newly born guinea-pigs, the difficulty is evidently one of his own creation. Others who have read the paper have not been similarly affected, and we think we may equally say with Seidelin (*vide* his paper) that we stated in detail what we found, and illustrated these findings by exact and well reproduced figures. Their demonstration also was not wanting, specimens being shown to well-known authorities on the subject, who were quite satisfied as to their similarity with the so-called *Paraplasma*.

Seidelin complains in his paper that we make it appear that in his own and in Johnston's and Macfie's experimental work with guinea-pigs controls had not been examined. In this connection it may be of interest to relate that when Dr. Johnston was recently at home one of us had the pleasure of seeing some of his specimens and asked him if control animals had been examined with the same enthusiasm and care as had been expended on the inoculated animals. He replied that controls had been done, and was then told that similar bodies had been found in English guinea-pigs. Since his return to West Africa he has undertaken the examinations of numbers of uninoculated guinea-pigs, with the result, which we anticipated, that he has found a large percentage harbouring bodies identical with those found in inoculated animals. This then proves that the earlier work had not been sufficiently controlled. We are not concerned here with the extraordinary conclusions this result has led him into, but we feel sure that any unbiased person will conclude that the bodies in guinea-pigs at home and abroad are identical.

Turning now for a moment to the question of the clinical diagnosis of yellow fever, Seidelin states that it is not known that we possess much personal experience of the disease. It may surprise him to learn that one of us has specially studied an epidemic of the disease and the question of the epidemiology of the disease generally in the West Indies long before he himself appeared upon the scientific scene. In this epidemic not only were mild cases of the disease specially studied in view of the continuation of quarantine for the island where the malady occurred, but *post-mortem* examinations were made, bloods examined, and the other ordinary routine work duly carried through. Apart from this fact, we cannot help feeling that no amount of clinical experience will enable a person to diagnose mild and atypical cases of yellow fever beyond dispute. In all epidemic diseases the mild and atypical cases are in many instances considered such because they occur side by side with typical cases in persons who might just as well have had severe attacks. Outside the epidemic area it becomes practically impossible, in the present state of our knowledge, to diagnose these cases. In those diseases where a definite parasite exists and can be found this difficulty is to a large extent overcome. We still feel that the Jamaica case was diagnosed as yellow fever because of the presence of Seidelin's bodies in it. Having taken up the position that such bodies are diagnostic of this fever the corollary follows that any case harbouring them must be yellow fever or a carrier of this infection, even if it occurred in the heart of London.

Seidelin states that "so far no one has used the experiments on animals as decisive evidence in favour of the importance of *P. flavigenum* in yellow fever," yet he has advocated, with all seriousness, the practice of protective inoculation against yellow fever by the use of the blood of inoculated or sub-inoculated guinea-pigs harbouring the supposed parasite. Surely this is employing experiments on animals as decisive evidence in favour of the importance of "*P. flavigenum*" in yellow fever. As regards this vaccination, it is just because we are serious that we have pointed out the weakness of the suggestion, for we cannot consider it as the logical outcome of previous work, which appears to us to have been full of fallacies. We state again here, and that emphatically, that there is no evidence of Seidelin's bodies being the cause of yellow fever, and that his and his disciples' inoculation of guinea-pigs with such bodies is fallacious.

We have now said enough to clearly define our position, and we do not propose to enter into a polemic with Dr. Seidelin on the subject. We leave the question in the hands of the scientific world, the vast majority of which are favourable to our views and have decided against the parasitic nature of Seidelin's "*P. flavigenum*."

Alopecia Atrophicans (Pseudo-pelade of Brocq).—Dreuw (*Urologic and Cutaneous Review*, November, 1914) describes the disease as slowly forming small irregular-shaped patches, with ill-defined borders. The surrounding hair shows a whitish-grey sheath round the bulb. There is no formation of scales. No parasitic organisms are found, but it seems to be clinically contagious. In 1910 an epidemic was described in a German school. If treated early it yields to anti-parasitic as:—

Ol. rusci		10
Beta naphthol, acid salicyl. resorcin	āā	2
Sp. vini	ad	100

Rubbed daily into the patches.

Once a day this ointment is applied (if at bedtime the scalp to be covered with a bandage or cap):—

Sulphur	10
(or Pyrogallol 1)	
Resorcin	4
Adeps lanæ hyd.	100

Twice a week the scalp is washed.

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THE JOURNAL OF

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MARCH 1, 1915.

THE THERAPEUTIC VALUE OF SNOW.

To the tropical resident snow is usually regarded as a danger to health and as presenting a condition of things to be avoided and decried. The discomfort of feeling cold no doubt accounts for much of the prejudice against wintering in a cold climate, and snow in particular; and the knowledge that the thaw brings with it an aftermath of climatic conditions which it requires a fortitude to endure with equanimity. Especially is this felt by those at home on leave and with but a limited time to get as much pleasure out of their stay as possible. But snowy weather with variations, and the persistence of snow on the ground, are two totally different things. In England snow is looked upon as a nuisance, knowing from experience what, in a day or two, "is to come after." The freshly fallen snow is a joy to everyone; but the inconvenience of travel, the churned up mud and filth in the streets of our towns, and the disorganization of vehicular traffic, which follow upon the short-lived pleasure, owing to the certainty of a speedy thaw, conduce to justify British folk in their opinion of a fall of snow.

It is no wonder, therefore, that the tropical resident who seeks British shores in the winter months, hoping that the cold weather may serve as a tonic and as a means of eradicating the effects of a long residence in the Tropics, is disappointed. In England snow becomes rather a pathological than a physiological factor; for the dampness that accompanies or sharply follows the fall is not calculated to serve as a beneficial agent in restoring health and vigour to the rundown tropical dweller.

To derive benefit from snow and all that its presence means it is necessary that there be a period of permanency in its stay. The countries we can look to where this requirement is to hand, and which are suitably situated for British folk to readily reach, are Switzerland, Norway, and Canada. Switzerland has for some time been favoured with almost the whole of the patronage of those who seek residence for a time in a snow-clad country; but it is only within the past ten years that persons suffering from malaria have been deliberately sent thither by their doctors. Before this date such advice would have been looked upon with suspicion or regarded as unwise. That a patient suffering from malaria accompanied by a large spleen should go in the month of January to 5,000 ft. up in the Swiss hills and there join in all the outdoor life and sports going forward amounted to a revolution in the treatment of malaria. Yet even this step, taken by a young man home from the West Coast of Africa, who, against medical advice, and whilst suffering from severe attacks of intermittent fever and with a spleen down to the level of the umbilicus and reaching forward as far as the middle line of the abdomen, went to one of the high altitude resorts in Switzerland. The result was beneficial to a degree; he returned in eight weeks with a spleen impossible to be felt by deep palpation, nor could the malarial parasite be found in his blood. He persuaded a friend from the West Coast, also suffering from malaria and big spleen, to join him, after he had first experimented upon himself as to the advent of the deadly effect prophesied by his friends of dwelling in a Swiss mountain sports resort in winter. His friend benefited in like manner, and subsequently when on leave from the West African coast did these men go to the Swiss hills in winter.

The example, once set, has been followed, and medical men can, with entire confidence, recommend the snow-covered high resorts in Switzerland as the best place for the tropical resident, be they suffering from anæmia, from attacks of malaria in any form, from enlarged spleen due to malaria, or from being "run down" in health. How different is this recommendation to that which held

good until a few years ago, namely, that the malarial patient should come to England by easy stages, dwelling first in Italy for a time, then the South of France, then the Channel Islands or the South-west Coast of England, before venturing further north. Now a patient is no sooner home than, if it is winter, he is sent to dwell amongst snow and at a high altitude. For patients with intestinal troubles high altitudes in winter are not to be recommended; sprue cases do badly, so do those suffering from post-dysenteric ailments, colitis, &c. They cannot, and should not, join in the violent winter sports in vogue, and to sit by the edge of a skating pond, to stand watching the toboggans pass, and to be a mere onlooker whilst others take violent exercise is not exhilarating for either mind or body. In fact, any condition or form of illness in which active exercise is unwise should negative patients being sent to the Swiss hills in winter, for without exercise the benefits are more than doubtful.

Passing from Switzerland to Norway, there is no doubt that, given facilities of travel and good accommodation, Norway may become a serious rival to Switzerland as a winter resort. The air in Norway is, if anything, keener and more bracing, the "runs," &c., are capable of being made perfect, the comforts are well attended to, the sports are excellent, for is not Scandinavia the home of ski-ing? Although the hours of daylight are shorter in Norway than in Switzerland, the weather is more consistent and the not infrequent temporary thaws and bad weather in Switzerland, which are not only disappointing but actually unhealthy, are far less apt to occur in the mountains of Norway. There is also the attraction to a good many that in Norway the influx of visitors is not as yet so overwhelming as to render life at one of its hotels anything but restful.

Canada has hitherto not been brought forward as a health resort in winter; in fact, Canadians have as a rule tried to burke any reference to the severity of their winters. At one time it was thought necessary by Canadian writers and agents to repress any reference to their hard winters, and Kipling's poetic baptism of Canada as "Our Lady of the Snows" was keenly resented by Canadians generally. Curiously enough, during the last few seasons the snow has been late in falling, and the winters have been rather more "open" than usual, and Canadian newspapers have this winter (1914-15) been drawing attention to the fact and regretting the change. When the snow did fall a hearty welcome was afforded it, for it seemed to come home to them that snow served as a hygienic agent and as a fertilizer of the soil of prime importance. Both of these factors are well known to everyone, but for the first time it has given occasion to the Canadians not to hide the fact that their winters are hard, but to rejoice in the circumstance and declare its benefits. As an economic factor snow is of undoubted benefit to the soil; it kills vermin; when it gradually thaws it soaks into the ground in a way rain does not; it prevents the frost going so deep into the soil that not all the heat of summer suns could thoroughly undo, as in certain Siberian districts. The hygienic factor of the presence of snow is also, and rightly so, being made much of in Canada. Her soldiers, after the experience of Salisbury Plain and the trenches in Northern France, where rain and mud prevail, have come to form a higher opinion of the winter season in Canada, preferring the persistent snow with dry bracing air and bright sunshine, thus affording opportunities for winter sport and easy transport, in place of the open winters in Britain, where slush beneath and a leaden sky overhead scarcely compensate for the absence of snow. Canada should, moreover, prove attractive to the tropical invalid reduced in health and vigour by malaria. The European residents in the Far East might travel hence across Canada, stay for six weeks at a high altitude amongst the snow at a place such as Banff on the Canadian Pacific Railway. In time the place, with attention to accommodation, good housing, good food, and especially to winter sports, would become a centre; Banff or similarly situated place would become for the Far East, the West Indies, Central America, and even the Equatorial regions of South America, a winter health centre, just as Switzerland has become a winter resort for Europeans returning from India, East and West Africa, and at present the Far East. One great advantage moreover Canada can claim is that it is within the Empire, a fact which British folk at any rate will appreciate.

Let us hope Canada will develop such a winter resort as referred to above; it would be of the greatest benefit to the tropical dweller, especially from countries bordering on the Pacific, for it is on the way "home," and there in the snow field, as experience has shown, they can get rid of malaria and its consequences before reaching Britain. Cold, dry, and bracing air in a snow-clad country, with its attendant benefits of high ground, is calculated to "cure" malaria more speedily and thoroughly than dosing with quinine and arsenic. It is at least three years before a deep malarial infection can be got rid of in Britain, whereas in the hills of Switzerland, Norway, and Canada it can be practically eradicated in as many months.

J. C.

Medical Note.

In the treatment of pellagra we have reports of the good effects of (1) thymol in heroic doses; (2) hexamethylenamine, and (3) chlorine water. Dr. E. A. Bowling (U.S.A.) recommends the chlorine water to be made as follows: To 40 gr. of potassium chlorate add 4 dr. of hydrochloric acid, and when the gas is given off freely pour in 8 oz. water. A teaspoonful of the chlorine water thus made is given every two hours. The idea of this treatment is to thwart intestinal micro-organisms which Bowling considers is the cause of the disease.

Annotations.

Genital Symptoms in Appendicitis.—Lanz (*Zent. f. Chir.*, Leipzig, vol. xli, No. 48), besides the pain elicited by pulling on the right spermatic cord when there is acute appendicitis, has found other differentiating phenomena. Particularly in children frequent and painful micturition is often an early sign of appendicitis. In both children and adults, when the forefinger is worked into the inguinal canal on the left side, no appreciable resistance or pain is experienced, but on the right, if the appendix is inflamed, the muscles contract as the finger is introduced into the inguinal canal, so that it is impossible to work it in deep, and if the patient coughs while the finger is in the canal there will be local pain. The spermatic cord is also painful on pressure when it is pulled, and when it emerges from the canal it is swollen and tender. The cremaster reflex on that side is usually weak or abolished entirely with acute appendicitis. If the appendix is situated abnormally low, muscular rigidity and tenderness may be found in the lumbar region or may be detected through the rectum. The sphincter muscle is relaxed when the pouch of Douglas is being invaded; when there is actual suppuration in the pouch, the sphincter may gape completely.

Cholera and Vaccination.—L. Arzt (*Wien. klin. Wochenschr.*, xxvii, No. 47, pp. 1501-1528) had 24 per cent. mortality in his cases of cholera. He applies friction of the body with spirit of camphor during the painful cramps, and injects salt solution, sometimes using a 1·5 per cent. solution. After the patient has passed the first collapse he gives bolus alba systematically and repeats the saline infusion twice a day. Three of his patients had a pronounced eruption during the cholera. One of his attendants contracted cholera after anti-cholera vaccination. The second vaccination followed the first in five days, and two days later she developed cholera, but it ran a mild course, with complete recovery in five days. One man was vaccinated during the incubation of cholera and except for vomiting he had no further symptoms of cholera. There were no serious by-effects from the anti-cholera vaccination in any instance.

Suppuration in the Thyroid (Scalone, *Policlinico*, December 6, xxi, No. 49, pp. 1705-1740).—The patient was a woman, aged 56, who had had the thyroid enlarged at times during her earlier pregnancies, but it always returned to normal size afterwards. At about the age of 50, after typhoid, there was extensive suppuration in the thyroid and a fistula was left; it caused great discomfort. The discharging fistula led into a large cavity with calcified walls. Attempts to clear away the lime deposits caused such pain and disturbance in neighbouring organs that they had to be abandoned. After sterilizing the cavity with iodine, he injected about 25 c.c. of the Mosetig iodoform filling, and sutured the mobilized skin at the opening. At first some scraps of the filling were cast off, but then everything healed smoothly and the patient was cured of all trouble.

Treatment of Sleeping Sickness.—E. Reichenow (*Deut. med. Wochenschr.*, Berlin, December 3, xl, No. 49, pp. 2025 to 2052) says that trypanosomiasis of the blood does not become sleeping sickness until the trypanosomes get into the cerebrospinal fluid. When they are in the blood, they can be reached by drugs, but this is a more difficult matter when they are in the cerebrospinal fluid. He has given neo-salvarsan in intraspinal injections. The number of trypanosomes in the fluid markedly declined after the patients had taken by the mouth 200 grm. alcohol on three successive days, given because it passes into the cerebrospinal fluid. He never succeeded by this means, however, in clearing out all the trypanosomes from the fluid, but some drug may yet be found which diffuses into the fluid, and will kill off all the trypanosomes.

Rheumatic Disease in the Field.—A. Schmidt (*Med. Klin.*, Berlin, December 6, x, No. 49, pp. 1755 to 1789) says that in almost every instance there was some preceding tonsillitis or rheumatic affection. In many cases of intestinal trouble or dysentery the swelling of several joints was seen, as also with suppurative colitis, demonstrating that the intestinal mucosa serves as a portal of entry for general infection more frequently than is ordinarily recognized. In other cases the joint swellings were evidently a symptom of septic conditions, as the spleen was enlarged, and there was high intermittent fever, with albuminuria, and sometimes pneumonia. The portal of entry here was evidently the gunshot wound, although this had healed in the interim. From one-third to one-half of the rheumatism patients had already had attacks of rheumatism before the campaign. The legs are affected much more than the other joints, and the men ascribe this, as well as the rheumatism in general, to the wet and cold in the trenches; but the strain of the long marches is a more plausible explanation. In many cases an obstinate "rheumatic affection of the foot" turned out finally to be a "march fracture" of some metatarsal bone, or flat-foot derangement. Benefit results from injection of salt solution or 0·5 per cent. solution of novocain. With myalgia the injection is made at the point where the pain is greatest. With neuralgia, at the point most sensitive to pressure; with more diffuse pain, as with bilateral sciatica, severe lumbago or migrating myalgias, the injections should be given by the epidural or lumbar intraspinal technique.

Intestinal Disease resembling Dysentery.—E. Leschke (*Deut. med. Wochenschr.*, Berlin, December 3, 1914, vol. xl, No. 49) says that intestinal disturbance resembling dysentery may prove on bacteriologic examination to be a harmless and transient intestinal trouble, not requiring isolation.

Cases were treated with rest in bed, fluid and soft foods, moist heat to the abdomen, with or without some magnesium preparation, but the main reliance was on charcoal biscuits, which are taken frequently up to fifteen, twenty-five or more during the day. The finely pulverized charcoal, especially blood charcoal, absorbs the toxins and products of putrefaction, and in a few days as the stools become normal the ordinary diet can be resumed.

Stab Wound of Pregnant Uterus.—V. L. Brown (*Russky Vratch*, Petrograd, xiii, No. 27) reports a case where a nine-months' pregnant uterus had been stabbed with a knife. The wound was 2 in. wide, and through it the membranes of the fœtus could be seen. The wound was closed with interrupted silk sutures. In spite of the fact that six hours later labour began, with delivery in five hours, there were no complications on the part of the uterus and the patient was discharged eleven days later in perfect condition.

Notes and News.

INDIGO.

The disturbance of trade supplies owing to the war in Europe is evident in many directions, but in perhaps none more markedly than in that of the dye—indigo. It is a matter of history how the German synthetic product has supplanted the original source of the dye, the indigo plant. But the war has altogether annulled the artificial indigo supply from Germany, and there is a great rush to get Indian plant indigo, with the result that the price has advanced greatly.

Before 1895—that is, before synthetic indigo was on the market—the value of indigo produced in India was £3,566,700, whereas in 1914 it had fallen to some £700,000 only. An extensive area of land amounting to over a million acres was thrown out of cultivation, and many people were deprived of their means of livelihood.

The value of indigo as a dye is due to the fact that it is one of the fastest of the blue dyes, and is largely used in dyeing serge and the cloth used in the uniforms of the sailors of the British fleet. Indigo dye is stated by Mr. F. M. Perkin, in his paper read before the Royal Society of Arts, to have been used in early Egyptian times, and that blue cloth dyed with indigo has been found round mummies more than 5.000 years old; and Pliny mentions *indicum* as a paint obtained from India.

Oriental indigo, however, was not introduced into Europe until the sixteenth century, when considerable opposition was shown to its use, owing to the fact that a native indigo was already in use, no other, in fact, than *woad*, that mysterious colouring matter referred to in our school books as being the substance the aboriginal natives of the British Isles stained their skins with, in place, it is said, of wearing clothing.

OVERSEAS WAR CONTRIBUTIONS.

Generous contributions to the War Funds by Overseas countries of the Empire is a welcome sign of the unity of all the King's subjects and their wholeheartedness in the matter of thwarting the absurd ambition of Germany to dominate the world and to bind the peoples of all nations to the chariot wheels of a Teutonic conqueror. Under the heading of "Practical Patriotism" in a recent number of the *West India Committee's Circular* (quoted in the *Journal of the Society of Arts*, December 25, 1914), it is stated that a Barbados has given an equivalent of £20,000 to the Home Government for war expenses in the form of sugar; the gift taking this practical form at the suggestion of Mr. Harcourt, the Colonial Secretary. "British Guiana has started a National Relief Fund, in addition to which the sugar proprietors of that colony, by accepting a price some four or five pounds per ton below the present market price for 60,000 tons of sugar, have made, indirectly, a gift of some £200,000 to the national funds. Trinidad has also opened a fund, and the Bahamas and Bermuda are contributing largely from public and private sources. Other gifts in kind besides sugar are being sent from the West Indies, consisting of oranges, grape-fruit, cocoa, and arrowroot. From Africa, Lewanika, Paramount Chief of the Basutos, sends money to the Prince of Wales's Fund. The Somali chiefs send offers of service, the Emirs of the Northern Province of Nigeria contribute towards the military expenditure of the Nigerian Government, the Sultan of Sokoto sends a contribution to the Prince of Wales's Fund, as does Sierra Leone. The Falkland Islands and Fiji Islands send money to the Fund, while the latter is also preparing a small expeditionary force. The Maoris of New Zealand are keen to join the expeditionary force of that Dominion, and the Red Indians of Canada are giving money and personal service. Such contributions as these, and many more of a like kind, apart from the great gifts and services of India and of the self-governing Dominions, prove how strongly united the Empire is and how ready to support the Home Government in their great task."

BOVRIL AT THE FRONT.

Thanks to the initiative of Miss Gladys Storey, daughter of Mr. G. A. Storey, the Royal Academician, Bovril is now a first favourite wherever there is fighting. This lady had most successfully organized a fund for supplying the Army in France with Bovril. Her work had met with the warm approval of the authorities, including General Sir Horace Smith-Dorrien, who *à propos* of her recently published appeal headed "In Commemoration of Lord Roberts," wrote: "No suggestion has been so practical as your offer to provide the men in the trenches with Bovril, and such a project, bringing strength to our soldiers as it will, would, I am sure, have met with the approval of our much regretted late field-marshal." The Company have made a special donation to the Red Cross funds.

Original Communications.

NOTE ON THE INTERNAL TREATMENT OF YAWS.

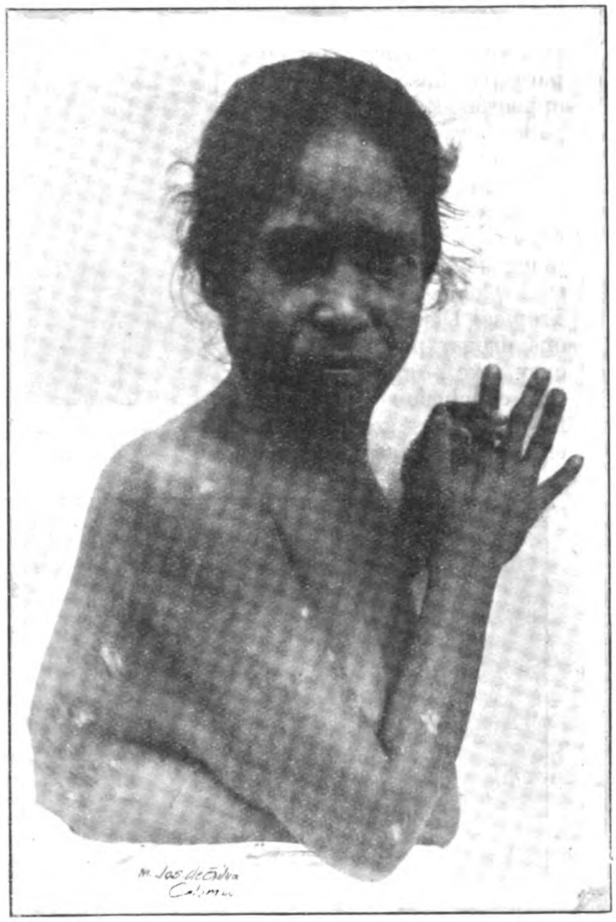
By Aldo Castellani, M.D.
Director, Government Clinic for Tropical Diseases, Colombo, Ceylon.

Ehrlich's salvarsan—first introduced for the treatment of yaws by Nicol, Strong, and myself—is without any doubt a specific which acts in a manner little short of marvellous on the disease. It would seem, therefore, superfluous to experiment at the present time with any other treatment. It must be noted, however, that while the salvarsan treatment can be easily carried out in large cities like Colombo, where well-equipped hospitals are available, and in other localities of the island where qualified medical men are present, it can only be used with great difficulty in districts of the interior, where hospitals are few and properly qualified men are scarce. On the estates also there is generally only an apothecary, who can hardly be entrusted with performing intravenous injections; moreover, some natives absolutely refuse any kind of injection treatment—either intravenous or intramuscular. At the present time another reason for experimenting with other forms of treatment, even if less efficacious, is the war, which has already caused a shortage of salvarsan, the exportation of this drug from England being forbidden.

For the above reason I have, since several months, again made researches on the internal treatment of the disease.

I will say at once that the mixture I am using contains no new substance, but a combination of easily obtainable drugs which have been found in the past to be beneficial in the disease by myself and others. If there is anything new, it is in the combination of the drugs, and in the measure of the doses given.

Singhalese woman affected with yaws.



Same woman after ten days' treatment with the mixture.

The mixture contains tartar emetic 1 gr., sodii salycyl. 10 gr., potassium iodide 1 dr., and bicarbonate of soda 15 gr., to 1 oz. water. This dose is given, diluted in 4 oz. of water, thrice daily for adults and youngsters over 14 years of age, half doses to children 8 to 14 years of age, and one-third or less to younger children.

Tartar Emetic.—Antimonial preparations were

first introduced in the treatment of yaws by Brault in 1911; he gave them by intravenous injections, as in sleeping sickness. In my experience such preparations have a beneficial effect, but the action is very slow.

Sodii Salicylate.—In the experiments I carried out in the clinic some years ago I found that this drug has a very slight beneficial effect in yaws; it has very little or no direct effect on the yaws lesions, but apparently hastens the disappearance of the thick yellow crusts due to secondary pyogenic infections.

Potassium Iodide.—Some years ago, long before salvarsan was introduced, I made some experiments in the Colombo Clinic for Tropical Diseases with various drugs, pot. iod., mercury, &c., and came to the conclusion that while mercury was generally inefficacious, potassium iodide gave fairly good results in a certain number of cases; the great drawback was that the good effects were obtained only by using very large doses, and these very often gave rise to such severe symptoms of iodism that the patients refused further treatment.

Singhalese girl suffering from yaws.

Same girl after twenty days' treatment with the mixture.

Sodii Bicarbonate.—The addition of bicarbonate to the mixture was made with the object of avoiding as far as possible iodism, thereby enabling one to give massive doses of potassium iodide, which only are really effective. The presence of large doses of bicarbonate seems also to diminish the emetic action of the antimonium present in the mixture.

Appearance of the Mixture.—The mixture is, pharmacologically, a very inelegant one; it is cloudy and has a sediment owing to the presence of a large amount of bicarbonate of soda. At the time of administering it, however, a dose is diluted with four times the amount of water, and then becomes fairly clear.

Effects of the Mixture.—I have tried the mixture in eleven cases, given in the doses mentioned for

ten to fifteen days, then five or ten days' rest, then another course for another five or ten or fifteen days. The results were very satisfactory in recent and fairly recent cases in which the disease had started three to twelve months previously; this can be seen from the annexed photos. In very old cases the results were much less satisfactory, and could not in any way be compared with those obtained with salvarsan and neo-salvarsan. Very mild symptoms of iodism were noticed in three cases, but were not sufficiently severe to stop the treatment or decrease the doses: it was, in fact, remarkable how well borne were, in most cases, the huge doses of potassium iodide given. In four cases in which I increased the tartar emetic to 2 gr. per dose nausea and vomiting occurred, and the tartar emetic had to be decreased again to 1 gr. per dose. No symptoms pointing to any depressing action on the heart were noted.

Résumé and Conclusions.

(1) Ehrlich's salvarsan and neo-salvarsan are without any doubt the *specific* drugs for yaws. Their efficacy in the disease is, in fact, almost marvellous. When, however, for any reason, such as shortage of the above drugs, the absence of properly qualified medical men in the infected districts, refusal of patients to be injected, &c., an *internal* treatment by easily obtainable drugs is desirable, the mixture I have suggested and used may be recommended, especially in recent cases.

(2) The mixture contains tartar emetic 1 gr., sodii salicyl. 10 gr., potass. iodid. 1 dr., sodii bicarbonate 15 gr., to 1 oz. of water. Three doses daily are given, diluted in four times the amount of water, to adults and youngsters of over 14 years of age; half-doses to children of 8 to 14 years of age, and one-third or less to younger children. The active drugs in the mixture are the potassium iodide, and in a very much less degree, the tartar emetic. The sodium salycylate seems to hasten the disappearance of the crusts. The presence of a large amount of bicarbonate of soda, though making the mixture very inelegant, apparently prevents to a great extent the symptoms of iodism and decreases the emetic properties of the mixture, in this way rendering possible the administration of massive doses of potassium iodide and large doses of tartar emetic. As regards other drugs tried, such as mercury and liq. arsenicalis, their action in my experience is practically *nil*, though occasionally such drugs may be incorporated in the mixture.

BRONCHIAL SPIROCHÆTOSIS.

By J. W. Scott Macfie, M.A., M.B.
West African Medical Staff.

Two cases of bronchial spirochætosis have recently come under my notice at Accra in the Gold Coast Colony, West Africa. Both the patients were male natives, and I am indebted to Dr. J. C. S. McDouall, under whose charge they were, for the following notes on their symptoms. The first case was admitted to the native hospital on November 6, 1914, a day or two after the onset of the illness, with a temperature of 104·5° F., and definite signs of pneumonia on the left side. The illness ran a somewhat chronic course, and the temperature chart was at one time suggestive of early phthisis. During the first week the temperature gradually fell until it fluctuated between 99° and 101° F., but for the succeeding three weeks little or no improvement took place, the temperature continuing to fluctuate widely between the same limits. On December 3 treatment with creosote was begun, and almost simultaneously the temperature began to fall until it reached normal degrees a few days before December 15, the date on which the patient was discharged convalescent. The sputum was examined on several occasions during the course of the illness. It was yellowish, and unlike the sputum typical of pneumonia; and, although pneumococci and tubercle bacilli were never detected, spirochætes were always abundant.

The second case ran a more acute course. On admission the patient stated that he had been ill for four days, and complained of pain on his left side. There was marked dulness at the base of the left lung. His temperature, which on admission was 102·5° F., ranged high until the fifth day, but fluctuated greatly, being sometimes as high as 105° F., and at others as low as 99·2° F. On the evening of the fifth day it fell suddenly from 105° to 98·4° F., and remained at or below normal until the patient was discharged. The sputum was slightly "rusty" on the second day, but was never really like that characteristic of pneumonia, and on succeeding days it was yellowish and nummular. Spirochætes were easily detected in it, but neither pneumococci nor tubercle bacilli could be found. The blood examination did not show any evidence of malaria.

It will be unnecessary to recapitulate the history of the recognition as a definite entity of bronchial spirochætosis, as this has been done in some detail by Chalmers and O'Farrell (1913). It may be mentioned, however, that the first record of the disease in Africa was that of Chalmers and O'Farrell (1913) in the Anglo-Egyptian Sudan; that soon after them Taylor (1913) described a series of cases which occurred in Uganda; and that recently Harper (1914) has recorded a case from Tamale in the Northern Territories of the Gold Coast, West Africa. It may be confidently predicted that now that attention has been drawn to the condition bronchial spirochætosis will be found to be prevalent in other parts of Africa also. Atypical cases of pneumonia and bronchitis are very common in West Africa, and are frequently remarked by medical officers. It is not improbable that a number of these will prove to be spirochætoses.

Morphology of the Parasite.

Castellani (1906 and 1907), who first identified bronchial spirochætosis in Ceylon, described the

morphology of the parasite he discovered, and named it *Spiroschaudinnia bronchialis*; but neither Chalmers and O'Farrell, Taylor, nor Harper have given any details of the organisms occurring in their cases. Chalmers and O'Farrell say "our observations tend to show that *S. bronchialis* (Castellani, 1907) is a good species, and that the different forms may probably be closely related to one another as different phases of growth and division of one and the same spirochæte rather than different species of spirochætes," and both these authors and Taylor state that a description of the morphology and life-history of the parasite would be given by Dr. Fantham. Harper, in his short note recording his case in the Northern Territories of the Gold Coast, contented himself with saying that the spirochætes were "very thin and delicate, and were of the commonest type mentioned by Castellani and Chalmers in their book on tropical diseases."

So far as I am aware, Dr. Fantham has not yet published his account of the spirochætes found in the Sudan and Uganda cases. It is, however, of interest to compare the spirochætes found in bronchial spirochætosis in Africa with those described by Castellani in Ceylon; and for this reason the following brief account is given of the organisms present in the cases at Accra.

In both the cases that have come under my notice in Accra the great majority of the spirochætes have presented a similar appearance, and have been of about the same degree of magnitude. They have stained well, but faintly, with the various modifications of Romanowsky's stain; but on the whole I have found gentian violet better for bringing out their details. The spirochætes tapered at both ends, and so far as my observations go have not shown any nodes or knots in their bodies. The average length is 8 to 9 microns, and there are three or four spirals. The breadth is about 0·25 microns. The spirochætes presented a regular appearance, and their spirals were constant and well marked. In one case twenty individuals, taken as they came, were drawn with a camera lucida, and measured by the tangent line method. Of these the shortest measured 6 microns and had three spirals, and the longest 13 microns and had six spirals. The latter was evidently a double form, and appeared to consist of two parasites 7 and 6 microns in length respectively, joined by a very fine filament. The longest single form encountered measured 12 microns, and had four spirals; and this would appear to be about the maximum length of the undividing spirochæte. This spirochæte, therefore, resembles in general appearance that figured by Chalmers and O'Farrell (1913) from the Sudan, but seems to be distinctly shorter.[1]

Unfortunately, I have had no opportunity of consulting Castellani's original description of *S. bronchialis*. Castellani and Chalmers (1913), in their "Manual of Tropical Medicine," however, classify the spirochætes found in the expectoration in bronchial spirochætosis into four groups, namely: (1) Very thick individuals, from 15 to 39 microns in length, with irregular coils which vary in number, but are never numerous; (2) individuals resembling *S. refringens*; (3) thin, delicate spirochætes, with numerous small uniform coils and tapering ends; and (4) extremely thin, delicate organisms, with very few irregular-shaped coils. They state, however, that there is little doubt that the term *S. bronchialis* (Castellani, 1907) "covers several varieties of spirochætes, and possibly different species." From this opinion Chalmers and O'Farrell apparently diverge, since they say "our observations tend to show that *S. bronchialis* (Castellani, 1907) is a good species."

In the sputum from the cases of bronchial spirochætosis occurring at Accra no spirochætes were found which could be assigned to either group (1) or (4) as defined above. As has already been said the spirochætes appeared to be uniform in type, and varied in size relatively slightly. They would probably all have to come into group (2) of Castellani, since according to Bosanquet *S. refringens* measures from 8 to 12 microns in length. If, as seems probable, Castellani has described under the name *S. bronchialis* several species of spirochæte, and if a study of further cases of bronchial spirochætosis at Accra shows consistently that the infection is due to the form of parasite described above, it would perhaps be advisable to separate off this type under a specific name.

Etiology.

There can no longer be much doubt as to the connection between the spirochætes found in the sputum and the disease of the lungs and bronchi observed to accompany them; and it will be unnecessary here to do more than merely state that in the cases observed at Accra the spirochætes appeared undoubtedly to be the cause of the disease.

It has been suggested that the spirochætes might be mouth spirochætes which, for some reason or another, had invaded the bronchi and lungs, multiplying in these organs, and giving rise to a specific disease. Chalmers and O'Farrell denied that this was the case in the Sudan, firstly because the mouth and throat spirochætes which occurred in some of their cases were "morphologically different from the typical forms of spirochætes in the bronchial mucus, and could be differentiated"; and, secondly, because they found that "merely chilling a monkey or injecting it with the pneumococcus will not lead to marked increase in the number of the usual spirochætes normally living in the top of the throat and in the bronchial secretion."

The buccal secretion and the *débris* from between the teeth were examined in both the cases of bronchial spirochætosis studied at Accra, and also in a number of healthy natives. Spirochætes were found to be common in every individual examined;

[1] The length of the six spirochætes figured by these authors (p. 330), and drawn at a magnification of 1,500 diameters, would average 13·7 microns, the shortest individual being 8 microns, and the longest 20 microns in length.

and it was possible to classify those with tapering extremities into at least four groups, namely:—

(1) Individuals averaging about 8 microns in length, with about six close shallow coils.

(2) Less closely coiled spirochætes, averaging 7 to 8 microns in length, and with three or four coils.

(3) Short spirochætes, averaging about 5 microns in length, with as a rule two open coils.

(4) Larger spirochætes, averaging about 11 microns in length, with three or four open, irregular coils.

The spirochætes of the second group resembled very closely those found in the bronchial mucus and were indistinguishable from them. It would seem quite possible therefore that the bronchial spirochætosis might have been the result of the invasion of the bronchi and the lungs by these organisms from the mouth as the result of some predisposing factor that is at present obscure.

Summary.

(1) In the two cases of bronchial spirochætosis recorded above spirochætes of a uniform type were found in the sputum, whose average measurements were 8 to 9 microns in length with three or four spirals, and about 0·25 microns in breadth.

(2) Spirochætes indistinguishable from these were found to occur normally in the mouths of healthy natives, and it is suggested that in these cases the disease of the bronchi and lungs may have been due to an invasion of these organs by these organisms.

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SEXUAL DISEASES DURING WAR.

On a peace footing there is a daily average of 1,748 men under treatment for venereal disease in the Austrian army. During war time the proportion usually increases: in 1871, in the first Bavarian army corps, the proportion ran up from 10·2 per thousand in January to 77·7 per thousand in May. Extensive epidemics in various districts followed the disbanding of the troops at the close of that war.

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THE JOURNAL OF

Tropical Medicine and Hygiene

March 15, 1915.

TROPICAL PROBLEMS.

Sir Ronald Ross, K.C.B., F.R.S., and Dr. Andrew Balfour have lately, though from different standpoints, been giving us their ideas of the urgent prospective factors which affect hygienic and sanitary work in the Tropics. Sir Ronald draws attention to questions of civil and military sanitation in the Tropics, and in his Chadwick Lectures at the London School of Economics discusses the relations between administration and public sanitation. Quoting Hume, Sir Ronald points out that it has been held by administrators that the maintenance of order, the prevention of crime, and the defence of the country from foreign invaders constitute the sole duties of administration;

but that commerce, economics, education, the prevention of disease, &c., were held to be outside the scope of Government measures. In developing his argument, Sir Ronald asks the question why civilization failed to find a footing in certain parts of the Tropics, and holds the opinion that the abundance of certain parasitic diseases of men and cattle, rather than "climate," is responsible for the failure. He holds that recently acquired knowledge has shown the causes of the great tropical ailments, malaria, yellow fever, tsetse-fly disease, dysentery, &c., but that administration has not advanced to a commensurate degree in applying the knowledge gained.

It may be said truly that until Colonel Gorgas and his colleagues asserted themselves when asked to deal with the prophylactic sanitation of the Panama Canal zone, medical men have never asserted themselves as the ultimate authority in a practical as well as in a theoretical sense. Priests, politicians, and Government authorities other than medical men have dominated and controlled sanitary administration since the very earliest times, even until the present day, and there are few signs that Governments, even the most enlightened, will to-day allow medical men to have the position and power which their knowledge and capabilities for administration would seem to justify. The public and Government of every nation seem still to associate doctors with pills and bottles of medicine only, that is, the treatment of disease; but, in the administration of the prevention of disease, authorities other than doctors are alone considered fit to carry out the necessary measures; and this in spite of the fact that all knowledge in hygiene has come from within the medical profession by their labours, their observations, and their genius. The fact is that doctors are not welcomed upon boards or committees, and even with but a grudging patronage in Houses of Parliament. As confessed by more than one borough councillor, the doctor is looked at askance on a council; he has no axe to grind, but goes there and preaches how to improve the health of the people, thereby lessening his own income, inasmuch as by following his advice disease would be lessened and his patients fewer. "There is nothing to be done with a man like that, for most of us are there for a set purpose, and not to propose measures that are going to take away our daily bread." When a great hygienic or medical matter is passed by a doctor's efforts, one outside medical circles is given the post of administrator, and remonstrance is put aside with a condescending and patronizing smile, that it is scarcely within the province of medical men to administer measures.

It is useless to point out that many medical men have proved themselves worthy of high administrative positions. Robertson in the Indian Medical Service, and McGregor in the Colonial Service, both medical men, are not the least honoured amongst Governors, and in the London County Council a doctor, Sir William Job Collins, won renown as the Chairman of that "business-like" body. By the Government, when a doctor is honoured, he is moved to the House of Lords, not to be a Cabinet Minister, and the heads of our departments of medical service in the Army and Navy are subordinated to subordinates of other departments. The day of the doctor will come, but meantime he is condemned and chained to "panel" practice, which is neither free nor is it granted the privileges of other State employments. It was Gladstone who prophesied that the day of the doctor's power is not far distant, and it will be a happy day for the nation and its workers when the dawn of that morning breaks.

Dr. Andrew Balfour, in his paper on the "Tropical Problem in the New World," deals with the scientific and practical wants of certain tropical countries which display themselves to the "sanitary eye." A most useful "eye" it is, and one which should be encouraged in every way amongst medical men.

In Barbados, curiously enough, it is a problem connected with the absence of disease that presents itself for consideration; none other, in fact, than the absence of malaria from this favoured isle. The reason for this absence it is difficult to fathom, beyond the fact that the Anopheles capable of producing infection are not there. This should seem surely to satisfy all men as an answer, but it is just the other way, for if malaria is absent in one region, may not these conditions be imitated in another and thus would knowledge increase? Dr. Balfour points out in this connection that the breeding places for Anopheles are not absent; the opposite was contended for by Dr. Malcolm Watson, but challenged by Dr. Low. How can the presence of "millions" in Barbados waters account for the absence of the Anopheles mosquito? Dr. Balfour, in passing, remarks that "millions" are not *Girardinus porcilloides*, but *Lebistus reticulatus*, a point of some importance for other countries to investigate. In his observations Dr. Balfour mentions yet another possible reason why Anopheles are not met with in Barbados, and that is the little backswimmer belonging to the genus *Notonecta*, a very abundant and voracious destroyer of Culex and Stegomyia larvæ, and no doubt would be of Anopheles did they come across their larvæ in Barbados waters. Dr. Balfour, after referring to Dr. Hutson's work and observations, adds: "Is it not, however, a disgrace that in a little island like Barbados, where there are few natural breeding places Stegomyia and Culex still flourish exceedingly? Given full powers and adequate assistance, more especially in the direction of trained British sanitary inspectors of the right type, I believe that Dr. Hutson, or any other energetic and tactful health officer, could clear Barbados of harmful mosquitoes within a year; that is to say, he could reduce them in numbers till they were no longer a potential or actual source of danger to the community."

The necessity for trained British sanitary inspectors in furthering sanitation and true hygienic effort in the Tropics has long been a contention of Dr. Balfour. Just as Sir Ronald Ross shows the

absurdity of placing laymen at the head of work of the kind under the title of administrators, so at the other end of the scale Dr. Balfour insists upon the necessity of workers of the right type being introduced. When he brought forward a proposal before the Tropical Section of the British Medical Association some years ago that it should be recommended to the Council that British inspectors should be thus employed, the motion, through lack of knowledge of the procedure on these occasions by the officials of the Section, although freely supported, was ruled out of order. This time it was medical men, not laymen, that stifled the measure, and many countries have suffered in consequence.

But Barbados, if peculiarly free of one scourge, is afflicted by another, also a mosquito-borne disease, namely, filariasis and its accompaniment elephantiasis. It would appear from this fact that neither the "millions" (*Lebistus reticulatus*) nor the little back-swimmers (*Notonecta*) are able to keep under the larvæ of the mosquitoes which transmit filarial embryos, an argument against these larvæ destroyers of being the cause of the absence of malaria. That these could be kept under there can be no doubt, but as Dr. Balfour remarks, this is not the case in Barbados; and it is amazing at this time of day to see the lethargy and indifference with which the mosquito question is treated, and it is astounding and disheartening to be told of the opposition which Dr. Hutson's diligent efforts encounter.

Dr. Balfour mentions several problems which require investigation and elucidation; but, above all, it is the application of our knowledge acquired of late years that wants enforcement. In Grenada, for instance, applied sanitation concerning ankylostomiasis calls for action. Teaching the natives the meaning of ventilation as a prophylactic against tuberculosis would tend to great good being done. In Trinidad the absence of kala-azar is interesting, seeing that coolies are freely imported from Leishmaniasis districts in India; and, again, can yellow fever exist in monkeys as plague exists as an epizootic in rats? brings up the question of a reservoir of the virus in yellow fever, and whether red howler monkeys (*A. geniculus*) may be the reservoir is a matter worth studying. These and many other problems are brought forward by Dr. Balfour in his interesting paper, all indicating the necessity for further investigation, and more especially for the advancement of applied hygiene to a degree which exists at present more as an idea than as a practical reality.

Staining of the Treponema Pallidum.—N. I. Drosdova (*Russky Vratch*, Petrograd, July 18, xiii, No. 27, pp. 933 to 964) says the Giemsa two-minute stain and Reitman's method, slightly modified, are superior to all others. With the latter, after fixation for ten minutes in absolute alcohol, the specimen is acted on by 2 per cent. phosphotungstic acid for two minutes. This is then washed off with water and alcohol, as with the original Reitman technique.

Translation.

THE DIRECT MICROSCOPIC LOCALIZATION OF THE TYPHOID BACILLI IN THE BLOOD OF THE PATIENT, AND ITS SIGNIFICANCE WITH REGARD TO DIAGNOSIS AND TREATMENT.

By V. A. Wille.

Samarang, Java.

Despite the value and assistance of the Widal reaction, its limitations cannot be ignored. In some few cases the reaction remains negative during the whole course of the disease; more frequently, however, it is negative from the beginning, and does not become positive until the second or third week. Another difficulty is that the reaction may remain positive even for years after the disease has disappeared, so that diagnostic mistakes may result from a former misjudged or forgotten case of typhoid fever. A further difficulty, which may at first seem surprising, is to know whether the disease has been cured or not, and it was this last which forced me to seek new methods.

I had under treatment a little boy, Herluf W., aged 1 year, who had been ill for eight months. He had certainly had typhoid, for the Widal reaction had been positive again and again. The disease, however, was of a more chronic character; the rectal temperature kept usually between 36·5° and 37·5° C., only exceeding this under special circumstances, without going beyond 38° to 38·5° C. A slight meteorism was the only other intestinal symptom. The glands behind the ears were a little swollen, and the child was somewhat anæmic (hæmoglobin (Gowers) 85 per cent.), though fairly well nourished owing to great caution and care in nursing; the spleen had formerly been somewhat enlarged, but was now nearly normal. The question was whether the child had had continual typhoid, or was only suffering from the consequences. On the one hand, it was painful to keep the child continually on subnormal nourishment, and on the other, I was afraid of risking a relapse by increasing the diet. The Widal reaction could not help me; and while trying to solve the difficulty I recalled an observation I had made some nineteen years previously, but had not then understood. The next time I went to examine the little patient, therefore, I took my microscope. I put a small drop of blood under the cover-glass, and started the examination. I had not to wait long for the result, for I had scarcely adjusted the microscope, when I saw numerous microbes actively moving in the blood-serum. They were short, limpid rods, up to 2 to 3μ long, but of varying size; their movements were rather quick, of a rolling character; there were ten or more in every field. While examining them they began to clot together, at first two or three, but later on in larger clusters, their movements at the same time getting weaker and weaker. In short, I saw a typical picture under the microscope of Eberth's bacillus, or rather, a bacillus of the typhoid-coli group, and the Widal reaction in the patient's blood.

I was naturally surprised by this discovery. I had no longer any doubt as to whether the disease was cured or not, but I asked myself why this observation had not been made before, as the bacteriology of typhoid fever has been studied so thoroughly. I continued the observations however, and during the three following months I repeatedly examined the same little patient's blood, continually finding bacilli, though latterly in decreasing numbers. I have also examined the blood of several other typhoid patients, sixteen in all, the Widal reaction being positive in every case; total observations numbered 160. With few exceptions ten fields were always examined. The enlargement was made with an oil immersion lens, $\frac{1}{12}$, and the weakest ocular, equivalent to 570 times enlargement.

I will first give a summary of the cases observed. Where the number of bacilli is mentioned it must be understood as the total of ten fields by 570 times enlargement, if no other addition has been made. I have deviated a little from the chronological order so as to arrange the patients by families. They are all from Samarang, or the more distant environs of that town.

Case 1.—Herluf W., aged 1 year 8 months. Bacilli still in the blood after eight months. The first examination has been described above, and there were numerous subsequent ones. Appropriate diet was found by aid of the microscope and scales, the number of bacilli being kept at 30 to 40. With even slight excess of the limit the number would rise suddenly to 100, 200, or 300, and the temperature, otherwise quite normal, run up a little, to 37·5° C. Then, when the diet was limited a little, the number of the bacilli would diminish as quickly as it had risen. When the blood is thus suddenly flooded with bacilli, the bulk of these are small, short, and apparently recently developed.

Case 2.—Mr. W., aged 50, father of the preceding patient. The patient had for some weeks felt weak and looked ill; there were no special symptoms. Widal reaction positive. The temperature was somewhat high, but under 38° C. April 5, 1912: About twenty-five bacilli found in the blood. Typhoid diet and rest in bed reduced the number to five to ten; with increased diet, however, it again rose to about twenty. Conditions unchanged seven months later. With this patient also swarms of bacilli would come after a faulty diet. This occurred several times, even a small quantity of meat immediately increasing the number of bacilli to more than 100; on the other hand, eggs and milk in limited quantity did no harm. The same thing has been observed with several other patients. Patient's strength nearly normal, and during the last five months he has been able to perform his rather taxing work. Latterly he has been able to take 125 grm. of meat a day, when well minced, without the number of bacilli increasing.

Case 3.—E. W., aged 16, daughter of the above. As the patient looked somewhat ill, but without showing any special symptoms, the blood was examined on April 4, 1912, and bacilli found; the number was not recorded. Slight rise of temperature, but below 38° C. The course was similar to that of the preceding patient. The usual number of bacilli was ten to twenty: but here also there was a sudden increase when the patient was taking meat. Widal positive in June, 1912.

Case 4.—August W., aged 10, brother of the above. The temperature rose to 38·5° C. Typical typhoid tongue. The spleen was somewhat enlarged. April 14, 1912: Numerous bacilli in the blood. Widal positive in June. He went through a complete typhoid cure, and at present his state of health is rather good; but his blood usually contains about thirty bacilli; in his case also their number increases considerably if he takes meat.

Case 5.—Mr. G., aged 46. The patient had had a severe attack of typhoid and malaria at the same time. Widal positive. After ten days' convalescence dysentery appeared, bleeding from the bowels, and then again malaria. In order to ascertain if there were a typhoid relapse also, the blood was examined on April 5, 1912, and bacilli were found, the number not being recorded. Under typhoid diet and proper treatment the condition improved quickly. I had no opportunity of examining the blood of this patient later.

Case 6.—Mrs. G., aged 47, wife of the above. This patient has had typhoid fever. Widal was positive. All symptoms were, however, thought to have disappeared more than three months previously. Latterly there had been a slight rise of temperature, not exceeding 38° C., with moderate colitis. April 4, 1912: Bacilli found in the blood, no record of number. Condition improved considerably, but later the colitis recurred, and gradually assumed the character of membranous colitis. As the patient was also tuberculous, she was given open-air treatment. On July 7, 1912, only two bacilli were found.

Case 7.—H. G., aged 15, daughter of the above. Within the last month she has had a slight attack of typhoid. Widal reaction positive. April 16, 1912, a few bacilli still in the blood.

Case 8.—Miss W., aged 41. The patient has had an attack of typhoid fever. It commenced six months ago, and she was under treatment for about two months. Widal reaction was positive. The patient has been working for the last four months, but has been delicate. April 16, 1912: Many motile bacilli found; but agglutination predominant from the beginning of, and increased during, the examination.

Case 9.—Miss M., aged 28. Some months ago the patient had an attack of protracted typhoid with very low fever. Widal reaction was then positive. She has been ailing since then. April 24, 1912: A few bacilli. In spite of rest, diet and mountainous air, the bacilli did not disappear from the blood. As the result of faulty diet they increased considerably: thus on June 8, 1912, there were about 100 bacilli; no fever; a week's dieting decreased them to three. The patient at present performs her work; but she is somewhat delicate.

Case 10.—Mr. van E., aged 55. A year ago the patient, a missionary, got ill while stationed at a lonely post in Celebes and lay some weeks without either medical treatment or nursing. Since then he has suffered from melancholia. Temperature is normal, and there are no symptoms of any bodily disease. April 13, 1912: A number of bacilli in the blood. In this case also the number of bacilli could be decreased by proper diet and rest in the open air, while there would be a sudden increase from faulty diet. The lowest number was attained on May 27, viz., three bacilli; the greatest number was found on July 28, viz., about 230. Proper treatment reduced this to eight on August 2. The psychical condition was gradually somewhat improved, partly by other treatment and altered circumstances, but bacilli were still found in the blood six months later. In June the Widal reaction was positive.

Case 11.—Adolf van E., aged 10, son of the above. Latterly the boy has been delicate and looks pale. Slight rise in temperature, which is, however, below 38° C. Spleen somewhat enlarged. Some bacilli were found in the blood on April 14, 1912. The state of health improved by dieting and rest in open air. The number of bacilli would vary from three to thirty-five, but they were still present after more than six months. In June Widal recation was positive.

Case 12.—Lestarie van E., aged 4, sister of the above. Has recently been delicate, and looked pale. Slight rise of temperature, sometimes a little above 38° C. The spleen was slightly enlarged. On April 23, 1912, bacilli in the blood were fairly numerous. Here also the patient's health was improved by diet, rest and fresh air; but bacilli, the number of which varied between ten and thirty, were still present more than six months later. In June Widal reaction was positive.

Case 13.—Albert Blondo, aged 6, a foster brother of the above. For a month previously patient had looked pale. June 17, 1912: Temperature 39·5° C.; the spleen was enlarged; tertian malarial parasites were found in the blood, and at the same time eighteen bacilli. Under proper treatment he was cured of malaria, but the bacilli were still present in the blood four and a half months later. In June the Widal reaction was positive.

Case 14.—Allan B., aged 8, has been ill for two months with repeated attacks of relapsing fever; was neither dieted nor kept in bed continually. His parents brought him here although

the voyage takes nine hours. They consulted me, thinking there was a question of naso-pharyngeal adenoids. Spleen somewhat enlarged, and typical typhoid tongue. Temperature between 38° and 39° C. April 16, 1912, examination of the blood, no malarial parasites, but numerous bacilli. The following day the Widal reaction was positive. He returned home, and, by rest in bed, diet and other proper treatment, was cured rather quickly. Since then there has been no opportunity of examining the blood.

Case 15.—Wadi, Javanese man, aged 17, was feverish; temperature was between 38° and 39° C. The spleen was enlarged from chronic malaria. July 8, 1912: Ten bacilli in the blood, and a few malarial parasites. The following day the Widal reaction was positive. Was transferred to hospital. No opportunity of further examination.

Case 16.—Jacoba van H., aged 25, has been ill for some weeks with anorexia, headache and weakness. Temperature a little above 38° C. August 22, 1912: five bacilli. August 27: Widal reaction positive. Patient cured within a month by typhoid treatment. No opportunity of further examination.

While these sixteen patients were under treatment 160 microscopical examinations of the blood were made, and bacilli found on each occasion. Agglutination was recorded in fifty-three observations on eight patients (Cases 1, 2, 3, 4, 8, 10, 11, 12); sometimes it was strong and widespread, in other cases only a couple of agglutinated bacilli were found in ten fields. To observe specially the agglutination, we must choose a case with many bacilli: at the end of half an hour it will usually be in full activity, but exceptions do occur. Thus, in Case 14, at the end of an hour there was not the slightest agglutination, although the Widal reaction was strongly positive. Here we had evidently to do with one of the stocks of typhoid bacilli, not liable to agglutination. [1] and [6]

In examining the blood I have followed the same rules as in malarial examination. The glasses are very carefully cleansed with alcohol; the needle and the finger-tip of the patient also being cleansed in the same way. A very small droplet of blood—smaller than a pin's head—is slightly touched with the centre of a cover-glass, which must not come into contact with the skin, and the cover-glass immediately dropped on the slide. If the glasses have been sufficiently clean, the blood will run out in a very fine film. In a successful preparation a central area will be found without any blood corpuscles, the "empty zone," and around that successively the "zone of scattered corpuscles," the "single-layer zone," the "zone of heaped-up corpuscles," the "zone of rouleaux," and the "zone of free hæmoglobin." Should a preparation be not quite successful, it can still be used for this examination, but there must be no currents in it; to avoid this, the film must not reach the border of the cover-glass. We could also, of course, examine a hanging drop; but I prefer the other method, because in this way we can examine for malarial parasites and typhoid bacilli in the same preparation. The microscopical examination itself is not difficult, but like every new thing requires patience in the beginning. It is necessary here to focus attention on the open lakes of serum between the groups of corpuscles: usually the bacillus is quickly seen, when by its movements, it is getting into the level for which the microscope has been adjusted; and we can follow it with the micrometer screw. The swarms of bacilli, however, which develop after a faulty diet, as mentioned above, may be a little difficult to see, as the bacilli under these circumstances are small and short. For the examination a $\frac{1}{12}$ oil immersion lens a low eye-piece and substage condensor have to be used.

When examining, we can also use stained preparations. A dry film is made from a small drop of blood in the usual way. After having been fixed for half an hour in concentrated alcohol, it is stained for ten minutes in carbolfuchsin, then washed with water, immersed for ten seconds in 25 per cent. sulphuric acid, again immediately carefully washed with water and dried.

As is known, typhoid bacilli are not "acid-fast," therefore the decoloration in acid must be short. Real isolated staining cannot be obtained in this way; but the bacilli are stained considerably more than the other formed elements, and if the microscope is adjusted a little too deeply they will appear black as ink from the refraction. I have made twenty-two examinations in this way [1] and the method has been very useful to me; but for the first test, when it is a question of making a diagnosis, the fresh blood film is preferable lest we should lose so important a criterion as the mobility of the bacilli.

When the bacilli have been found in the blood in this way, the question is what conclusions can be drawn from the fact? As to the bacteriological diagnosis, I suppose it is very probable that it was the *Bacillus typhosus* which was observed in the nineteen cases, in which the Widal reaction was positive. We might consider a secondary action of a paratyphoid serum; but in most of the cases the titre was rather high. In the eight cases where agglutination was observed in the blood, I suppose it may be considered as proved that the bacillus found was that of Eberth, as the same serum in the Widal reaction agglutinated authentic typhoid bacilli. Of course the conditions are quite different when we rely upon the microscopical examination only, without the help of either the Widal reaction or culture proofs. We are then scarcely able to do more than see that the blood contains typhoid, paratyphoid, or coli bacilli; but even this indefinite intelligence will in many cases be a valuable diagnostic help when compared with the other circumstances.

When the bacteriological diagnosis has been more or less definitely established, the next question is, what conclusions can be drawn as to the nature and treatment of the disease? As an instance take one of the cases where it is certain that the blood contains typhoid bacilli. We must first avoid drawing the conclusion immediately that the patient is suffering from typhoid (enteric fever); for, as the short medical histories given above show, it often occurs that the bacilli continually remain in the blood a long time after all symptoms of the disease have disappeared.

On the other hand, Case 1 and Case 8 are examples of such protracted disease that we can justly speak

[1] These examinations are not included in those mentioned above.

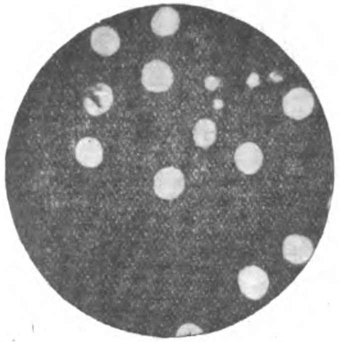


FIG. 1

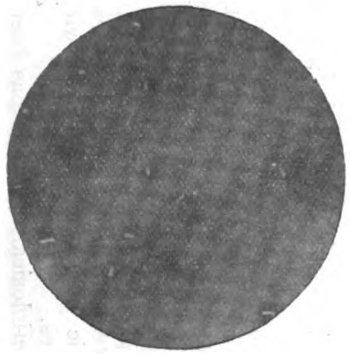
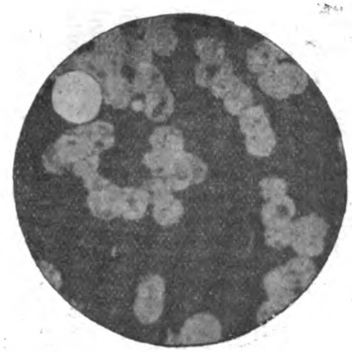


FIG. 2.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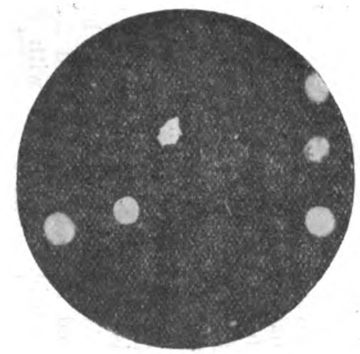
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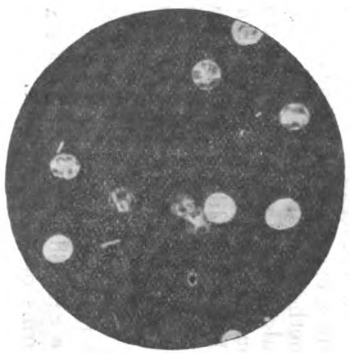
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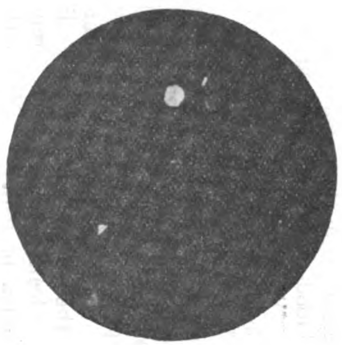
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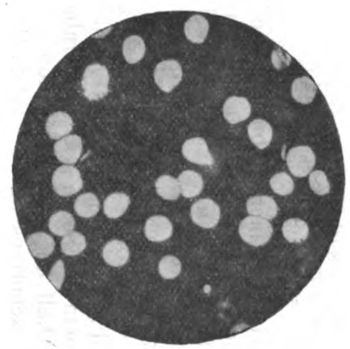
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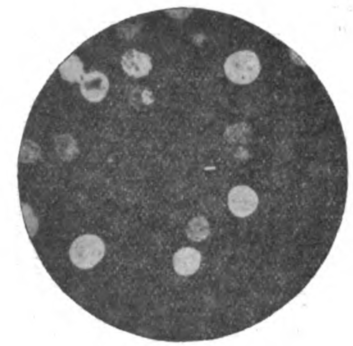
FIG. 10.

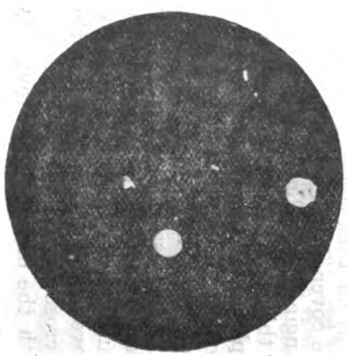
FIG. 5.


FIG. 6.

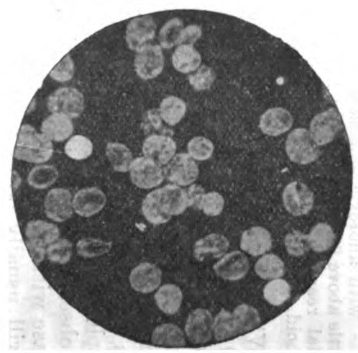
FIG. 11.

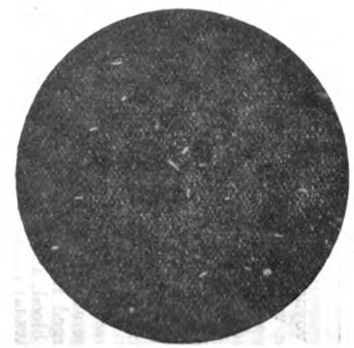
FIG. 12.

of a chronic state, a typhus abdominalis chronicus. This agrees with the medical histories of patients in the Dutch West Indies, both adults and children, who after a more or less severe attack of enteric fever have for years been delicate and suffered from intermittent recurrences of the disease, occasionally with a fatal issue.

In establishing the clinical diagnosis we must therefore consider all the circumstances; but in such cases this method of examination will help far more than the Widal reaction, as usually a great number of bacilli will be suggestive of existing disease.

In fresh cases this examination is specially significant as the bacilli appear so early in the blood, while the Widal reaction will sometimes keep us waiting for a time. By this means we are often able to make an early diagnosis, which is always an advantage, especially here in the Tropics, where we must so often face the question: malaria, enteric fever, or both. Similarly, as with the Widal reaction, however, we must keep in view the fact that a positive result may be the effect of a former attack of the disease.

This examination will guide us not only in diagnosis, but also in treatment, and proved itself very useful, and 4. This was during convalescence; when we were increasing the diet, meat would be tried for the first time. Hitherto the diet had been: ½ litre of milk; ½ litre of porridge; and five to six slices of white bread with a little butter. The numbers of bacilli were: In Case 2, 6; in Case 3, 8; and in Case 4, 4. On May 30, 1912, a piece of boiled chicken was given to each one. Case 2 got about 60 grm., Case 3 about 30 grm. and Case 4 about 60 grm. On examination on May 31, the following bacilli were found: In Case 2, 55; in Case 3, 19; and in Case 4, 131. No rise of temperature. Cases 3 and 4 had a little headache. The patients then returned to the former diet; but I had only the opportunity of re-examining Case 2. The following day, June 1, he had 16 bacilli, and on June 2, 8. That day he was given one soft boiled egg and one sardine, and the following morning two sardines. At 11 o'clock the same forenoon 57 bacilli were found. He was again put on the old diet, and the following day the number of bacilli was 12. The meat and the fish appeared constantly to increase the number of bacilli. At present these patients can stand bread and rice, vegetables and beans, milk and eggs, but not meat.

DESCRIPTION OF THE FIGURES.

The photographs were taken by the author from blood preparations, according to the Burri method.

I have to thank Dr. Th. Madsen, Director of Statensseruminstitut in Copenhagen, and Dr. W. A. Borger, Director of Instituut Pasteur in Batavia, for giving me permission to publish photographs of typhoid-cultures from the respective institutes.

Fig. 1.—Blood without bacilli.

Fig. 2.—Authentic typhoid bacilli (Seruminstitut in Copenhagen).

Fig. 3.—Blood with bacilli; twelfth day of disease. Case 17, August 20, 1913.

Figs. 4 and 5.—The same blood film; agglutinated bacilli.

Fig. 6.—The same blood film; gigantic bacillus.

Fig. 7.—Blood with bacilli; nearly two months after the beginning of the disease. Case 20, March 3, 1914.

Fig. 8.—Blood with bacilli; more than two months after the beginning of the disease. Case 18, March 3, 1914.

Fig. 9.—Blood with bacilli; more than two months after the beginning of the disease. Case 21, March 10, 1914.

Fig. 10.—Blood with bacilli; twenty-seven months after the beginning of the disease. Case 1, September 13, 1913.

Fig. 11.—The same blood film; agglutinated bacilli.

Fig. 12.—Authentic typhoid bacilli. (Instituut Pasteur, Batavia.)

especially in Case 1. As a matter of fact, again and again, through faulty diet, the number of bacilli has increased very considerably, before the temperature has begun to rise, or other symptoms have appeared. As soon as the fault has been corrected, the number of bacilli has decreased as rapidly as it increased. Here we have a sensitive and prompt method of control. In Case 1, where we had stood uncertain and fumbling, constantly guided by the microscope and scales, we succeeded in finding the narrow way, which led to a continual increase in weight, strength and health. We learned that we must abandon the use of fresh cows' milk, which, where the patient was living, was much too inconstant in concentration, and proceed to the use of unsugared, condensed milk; and we also learned how much milk we could give. If this limit were exceeded by, for instance, 25 grm. of condensed milk, there would immediately be an overflow of bacteria, the number increasing from 30 to more than 250. This host of bacilli, as stated above, would consist mainly of small, short microbes, evidently young ones just evolved.

In several of the other cases also, the method has been used in this way as a control, as in Cases 2, 3

On September 23, 1912, the number of bacilli in Case 2 again increased from 22 to more than 100 after having taken a little meat for a couple of days. Latterly, however, he seems able to stand some meat, when well minced, for after taking about 100 grm. a day in this form for three days, there were only 8 bacilli on November 12.

These dietetic examinations do not claim to be complete. They may, perhaps, give some useful hints; but they are mainly referred to as instances of the application and the usefulness of the method. For the sake of completeness, I may mention that the number of bacilli often, but not always, has been markedly increased by large doses of quinine.

I will just add a short *résumé* of the results of the examination:—

(1) The typhoid bacilli can be found directly in the blood, without difficulty, by microscopical examination.

(2) In several cases this examination can be a useful help for the diagnosis.

(3) The presence of the bacilli in the blood is in itself no proof that the person examined is a typhoid patient at this moment; the bacilli may be caused by a former illness.

(4) Yet this examination, compared with other symptoms, shows that enteric fever in some cases has a chronic course.

(5) In nearly all the cases examined bacilli have been found in the blood many months after the disappearance of the other symptoms.

(6) Faults of diet, especially the use of meat, sometimes also big doses of medicine, will markedly increase the number of bacilli.

(7) The examination, therefore, can give useful hints as to treatment.

According to these results, it may be hoped that this new method of examination, combined with the Widal reaction, will be of some use in the diagnosis and treatment of enteric fever.

(*To be concluded.*)

Notes and News.

THE SILK INDUSTRY OF SYRIA.

THE silk industry of Syria has been from ancient times one of the country's principal sources of wealth, but the amount of silk produced in late years has been considerably reduced. The eggs used for hatching silkworms are imported from the Department of Var, France. The imports and production of eggs are being reduced yearly, and many proprietors of mulberry grooves have been obliged to cut down or root up their mulberry trees and replace them with orange trees. The eggs are shipped from France every year on or about August 15, according to the climatic conditions, and reach Beirut about the first week in September. They are kept in Beirut until the end of October, and then are distributed among some of the monasteries in the Lebanon mountains, up near the snow-line, where they are kept in cool places until the hatching season, which begins in March. March 19 is the day fixed by all the silk producers for putting their eggs in incubators. After hatching they are tended in special huts made of rushes, reeds, grass, straw, and sticks until May 10 or May 15, according to the climatic conditions, when the first worms, after having been fed liberally upon mulberry leaves, spin their cocoons. There are over 150 factories in Syria that make a business of reeling the raw silk from the cocoons and selling it as thread or yarn. All the silk manufactured in Syria is made into skeins of a standard size used by French manufacturers of silk stuffs, and packed in bales weighing 220 lb. each. The total production of silk in Syria during 1913 was 770,000 lb., and Beirut exported 550,000 lb., which was about equal to the exportation in 1912.

RHODES SCHOLARS FROM GREATER BRITAIN.

ACCORDING to the statement for 1913-14 of the trustees of the Rhodes Scholarship Fund, the number of scholars in residence at Oxford was 177, of whom 76 were from the British Empire overeas. Since the beginning of the war a large number of the British students have taken commissions or enlisted as privates in the Imperial Army or in the contingents of the various Dominions. These will resume their scholarships at the end of the war. Twenty of the 88 United States scholars, included in the above total, have been given leave to assist in the work of distributing supplies under the auspices of the International Commission for Relief in Belgium. The following list gives the lines of work taken up by the 504 Rhodes scholars who have completed their terms: Education, 167; law, 130; clerical work, 20; social and philanthropic work, 8; medicine, 31; scientific work (research), 8; engineering, 4; mining, 4; diplomatic and consular service, 6; Civil Service—(British Empire) 22, (U.S.A.) 3, (Germany) 33; Army—(U.S.A.) 1, (Germany) 1; journalism, 13; business, 22; farming, 12; miscellaneous, 4; unsettled to date, 11; and unknown, 4.

THE GURKHA.

THE Gurkha, so prominent at the Front just now, is not the aboriginal inhabitant of Nepal, for his occupation of the country only dates from the eighteenth century. The original inhabitant of the country is the Newar, who is probably of Tibetan origin, whilst the Gurkha is supposed to be a Rajput in origin. The Gurkha regiments are by treaty agreements allowed to enlist and fight under the British flag; but they are "volunteers," and not under the British command further than the goodwill of the ruler of Nepal allows. Further, the country of Nepal is unique inasmuch as it remains as a solitary instance in the world of a friendly country which, from political reasons alone, is inaccessible to Europeans. For, though during nearly a century our relations with its rulers have been perfectly peaceful, and latterly even cordial, and though the present ruler of Nepal is a man of European culture, speaking perfect English, and understanding English customs, politics and civilization in a way that few Oriental rulers do, he has rigidly adhered to the policy instituted sixty years ago by the all-powerful minister, Jung Bahadur, and has maintained a system of government which may best be described as a paternal despotism founded on the religion and customs of his people. It is, therefore, impossible for Europeans even to enter Nepal unless specially invited.

BIMANUAL EXAMINATION OF PROSTATE.

THE bladder having been emptied, the patient lies on his back with the legs drawn up, and breathes deeply with open mouth. One index finger exerts pressure upwards in the rectum. The fingers of the other hand are slowly depressed above the upper edge of the symphysis. This nearly always allows of distinctions between prostatic enlargement and stone in the bladder.

Fig. 2.

To illustrate paper on "Pyosis Corletti in British Soldiers," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and Captain A. P. O'CONNOR, R.A.M.C.

Original Communications.

PYOSIS CORLETTI IN BRITISH SOLDIERS.

By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.

AND

Captain A. P. O'CONNOR, R.A.M.C.
Senior Medical Officer, British Troops, Khartoum.

Introductory.—A few months ago a small epidemic of a bullous eruption occurred in the 1st Battalion of the Suffolk Regiment. This eruption showed such definite clinical appearances and was so readily cured by a vaccine made from the organism which was grown from the bullæ that we think that a few remarks may possibly be of interest to some workers in tropical medicine.

Moreover, the marked confusion with regard to bullous eruptions in the Tropics, as is evident from a study of the literature, justifies any attempt to differentiate the various clinical pictures which may confuse the practitioner.

Historical.—Bullous eruptions appear to have been well known to the Arabians, for we find an account in Rhases which in its Latin form reads as follows:—

"Aliquibus membris pruritus et fervor intolerabilis, quandoque accidunt ubique succedunt, ubique succedents tempore ampullæ aquâ subtili plenæ generantur."

To this disease J. B. M. Sagar applied the name Pemphigus in 1771. At first only a chronic form appears to have been definitely recognized, but an acute variety was differentiated by Alibert in 1832, and has since been ably studied by Demme and by Pernet and Bullock. With regard to its causation, there seems to be a consensus of opinion that Demme's diplococcus is the etiological factor.

The term *Impetigo*, though originated by Willan, is to-day used in Tilbury Fox's sense for the disease called *Impetigo contagiosa*, which is considered by most modern authors to be due to some variety of *Streptococcus pyogenes* Rosenbach 1884.

In 1889 Manson, in Hong Kong, differentiated a bullous pyosis affecting the axillary and scrotocrural regions and due to a micrococcus in the form of a diplococcus. Since then this disease has been recognized in low-lying districts of the Tropics. Although one of us* was well acquainted with it in Ceylon we have only seen it once in Khartoum, which is situate at a height of about 390 metres above sea-level, and then it was only a mild infection in a native who did not belong to Khartoum and it was in the hot, damp season of the year.

Manson named the disorder *Pemphigus contagiosus*—a term which Castellani recently altered to "Pyosis Mansoni," because the disease is not a Pemphigus. The causal organism has generally been considered to be *Aurococcus aureus* (old name *Staphylococcus pyogenes aureus*), but the careful researches of Clegg and Wherry show that it differs in several points from this organism, and they therefore give it the name *Micrococcus pemphigicontagiosi Clegg and Wherry* 1906.

In 1899, according to Colcott Fox, Corlett described a contagious bullous eruption endemic in Florida which usually commenced on the face or hands and which later spread to the axillæ and more extensively over the body and limbs. It began as one or more reddish spots from a pin's head to a split pea in size, which became vesicles and later bullæ and were not associated with fever or marked itching. Then bullæ starting from healthy skin appeared; these bullæ became flaccid and then ruptured, leaving a margin which was apt to spread and which sometimes formed light friable crusts. This disease he called *Impetigo contagiosa bullosa*, and he considered the causal organisms to be Staphylococci, as he grew these in his cultures. Local treatment was very successful.

Sir Malcolm Morris recognizes Corlett's eruption as a variety of Impetigo in the fifth edition of his "Diseases of the Skin."

Manson, in the fifth edition of his "Tropical Diseases," draws attention to the cases described by Assistant Surgeon S. N. Singh in India, in which the bullæ in the children of three families were very large and in twelve out of thirteen cases unassociated with constitutional disturbance, but we have been unable to find the original paper and therefore cannot give details.

Cantlie, in China, described a bullous eruption on the sole of the foot and between the toes and occasionally spreading to other parts of the body. This disease is known as *Dermatitis Bullosa Plantaris*, and was shown by Castellani to be due to a streptococcus.

Christy tells us that he has recently met with this affection in the Belgian Congo, in the Ituri Forest.

In 1909 Paranhos and Pedroso studied the hæmatology of tropical pemphigus, finding a leucocytosis of 9,000 to 10,000 leucocytes per cubic millimetre, and a differential count of polymorphonuclear leucocytes 30 to 36 per cent., mononuclear leucocytes 5 to 6 per cent., large lymphocytes 8 to 9·5 per cent., small lymphocytes 21 to 27 per cent., and eosinophile leucocytes 22 to 25 per cent. Their differential count will be seen to totally disagree with the one we give below for uncomplicated cases, while the large number of eosinophile leucocytes suggest that either there was a complication in the case or cases from which the blood was taken, or that they were not dealing with the condition which we have under consideration.

In 1911 Castor described a series of cases in Burma under the term "Pemphigus Contagiosus," which appear to us to agree much more nearly with Corlett's description than with Pyosis Mansoni, as known to us. We will refer to these cases again later in this paper.

In the same year Bertarelli and Paranhos described a case under the term "Der Pemphigus der Tropengegenden," which does not appear to have been either Manson's or Corlett's Pyosis.

Macdonald, in 1912, in Southern Nigeria, described a case under the term Pemphigus Contagiosus, which ended fatally in fourteen days without evidence as to its spread by contagion. The whole description is so completely different from the Pyoses of Manson and Corlett that we are compelled to consider that it was some other affection.

In the same year Daniels, in the third part of his "Tropical Medicine and Hygiene," writing on the subject of Pemphigus Contagiosus, observes that *it is not certain that all the cases* described are truly of one kind.

In 1913 Castellani, in the second edition of the "Manual of Tropical Medicine," written by himself and one of us, gave a summary of the knowledge up to that date with regard to Manson's Pyosis and clearly defined this clinical entity.

In 1914 Manson, in the fifth edition of his "Tropical Diseases," and Plehn, in the second edition of Mense's "Tropenkrankheiten," brought the subject up to the date of writing the present paper.

It is hardly likely that this short history indicates even in the briefest manner anything like the literature on the subject of Tropical or Manson's Pemphigus and its allied disorders; but it is, unfortunately, all which we have at our disposal in Khartoum and, in our opinion, is sufficient to indicate the difficulty in arriving at a correct diagnosis of an acute bullous eruption in the Tropics.

The diseases which, in our experience, might possibly be confused are:—

(*a*) *Streptococcal Infections.*
(1) Impetigo Contagiosa (Bullous varieties).
(2) Dermatitis Bullosa Plantaris.
(*b*) *Micrococcal Infections.*
(3) Pemphigus Acutus.
(4) Pyosis Mansoni.
(5) Impetigo Contagiosa Bullosa of Corlett.

It must be admitted that although all workers in the Tropics recognize the difference between Pyosis Mansoni and Impetigo Contagiosa, still the European authorities are unwilling to allow any distinction.

It is true that in addition to the above there are some cosmopolitan diseases of unknown causation which are seen in the Tropics, and which may perhaps call for differentiation, *e.g.: Dermatitis herpetiformis*, which is not rare in the Tropics, but it would only be during an acute attack that there would be any difficulty, and even then it would be but slight and the eosinophilia should help the diagnosis. ***Epidermolysis Bullosa*** need hardly be considered as it is congenital in origin, while the *Chronic Bullous Eruptions* do not require differentiation, as we are dealing here only with acute eruptions.

Iconography.—For the purposes of recognition of skin diseases, it is helpful to be able to compare illustrations of eruptions and therefore we indicate some references with regard to this point in the diseases just mentioned.

Impetigo Contagiosa.—Illustrations are common, *vide* Jacobi Atlas, Parts III and IV, plate lxix, and Sequeira's "Diseases of the Skin," plate 13.

Pemphigus Acutus.—Allbutt and Rolleston's "System of Medicine," vol. ix, fig. 90, p. 430.

Pyosis Mansoni.—Castellani and Chalmers's "Manual of Tropical Medicine," second edition, figs. 547 and 548; also Clegg and Wherry, *Journal of Infectious Diseases*, vol. iii, 1906, p. 168, fig. 1.

Impetigo Contagiosa Bullosa of Corlett.—Allbutt and Rolleston's "System of Medicine," vol. ix, fig. 32, p. 168.

We will now describe the little epidemic which we met with recently in Khartoum.

Geographical Distribution.—The variety of bullous eruption which we are about to describe has only been observed by us in Khartoum in the Anglo-Egyptian Sudan, but we shall later bring forward evidence that it has been seen in Florida, India, and Burma. Burma comes under the heading of hot, moist climates, and so may India and to a less extent Florida, while the cases occurred in the damp months of Khartoum in which the relative humidity is often about 60 per cent.

Sex, Age, and Race Distribution.—It has only been seen in men of the 1st Battalion of the Suffolk Regiment, who were mostly about 20 to 25 years of age, and all of British birth. We shall, however, bring forward evidence that other observers have seen it in men, women, and children of various nationalities.

Etiology.—When a bulla is aseptically pricked by means of a sterile glass capillary pipette, and a preparation examined microscopically, diplococci (fig. 1) can be readily observed, but no other organisms. Scrapings from the wall or base of the bulla reveal only the same germs, but in much larger numbers than in the fluid. No streptococci could be found either in the lesions or in broth cultures, though looked for carefully, and even though Sabouraud's technique as to the use of the sterile pipette for pricking the vesicle and for inoculating broth was employed.

Morphology.—This organism colours readily with all the usual laboratory stains and retains its coloration when treated by Gram's methods.

It is non-motile, circular in appearance, measuring slightly more than 1 micron in transverse diameter, and is often seen grouped in staphylococcal masses (fig. 1).

Biological Characters.—It grows readily on all the usual liquid and solid media aerobically at 20° C., 37° C., and at 40° C. It is also a facultative anaerobe.

Its typical growth is upon agar-agar when it appears as discrete white colonies, about the size of a small pin's head, in twenty-four hours. These growths, after forty-eight hours, attain a size of 2 mm. in diameter and are raised from the surface of the medium, at the same time acquiring an orange-buff tint similar to that portrayed by Ridgway in his Colour Standards on Plate III, d, 15 Y-O. The colonies at this stage stand out from the medium as roundish beads with clearly defined edges which are slightly paler than the rest of the

surface, which is opaque and non-granular in appearance, resembling orange porcelain. In agar stabs it forms a nail-like growth, the head of the nail on the surface of the medium being orange in the centre with a white periphery.

The orange colour is not produced on Sabouraud's glucose and Maltose agars, although the colonies are otherwise similar to those described above.

On blood serum it produced glistening orange-buff colonies.

It grew well in gelatine at 20° C., forming a nail-like growth which liquefied the gelatine from above downwards. In broth and peptone water, and especially in glucose peptone, it grew well, giving rise to a general turbidity.

In litmus milk it produced acid and a clot in seven days, and the decolorization of the litmus was marked.

Sugar Reactions.—It produced acid, but no gas in the following sugar-peptone media after seven days' incubation at 37° C. All reactions were controlled by uninoculated tubes.

Monosaccharides.—Glucose, lævulose, galactose, mannose, and xylose.

Dissaccharides.—Maltose, saccharose, and lactose. With regard to the last named it sometimes produces a fair quantity and sometimes only a slight amount of acid, but it always produces some acid. The reason of the difference is not apparent as it happens with the same organisms from the same culture inoculated into lactose tubes of the same batch and incubated together.

It produced neither acid nor gas in the following media under the same conditions as above:—

Monosaccharide.—Arabinose.

Trisaccharide.—Raffinose.

Polysaccharides.—Dextrine, inulin, starch, and glycogen.

Glucosides.—Amygdalin, salicin, helicin, and phlorrhizin.

Alcohols:—

Tetrahydric.—Erythrite.

Pentahydric.—Adonite.

Hexahydric.—Dulcite, isodulcite, mannite, and inosite.

Other Reactions.—In neutral red peptone it did not produce a green fluorescence. It did not produce indol, nor give the Voges-Proskauer reaction, but it reduced nitrates to nitrites.

It grew well on potatoes and carrots, producing the typical orange growth.

Systemic Position.—From the above morphological characters it is sufficiently obvious that the organism in question belongs to the subdivision of the *Thallophyta* named *Algæ* Roth 1797, being included in the order *Cyanophyceæ*, of which they form the suborder *Schizomycetacea* Naegeli 1857. It is also obvious that the parasite belongs to the Schizomycete family *Coccaceæ* Zopf 1885 emendavit Migula 1900.

Of all attempts to subdivide this family that originated in 1905 by Winslow and Rogers appears to be the best. They divide it into two subfamilies, *Paracoccaceæ* and *Metacoccaceæ*.

The organism which we are considering belongs to the *Paracoccaceæ* because it is a parasite which can grow anaerobically and does not produce very abundant surface growths on artificial media. Its plane of fission produces pairs and never packets. It is coloured by Gram's stain. It produces acid in dextrose and lactose peptone media and it is pigmented, giving an orange colour.

The genera of this subfamily as described by Winslow and Rogers are five in number, viz.: (1) *Diplococcus* Weichselbaum 1886 emendavit Winslow and Rogers 1905; (2) *Ascococcus* Cohn 1875 emendavit Winslow and Rogers 1905; (3) *Streptococcus* Billroth 1874 emendavit Winslow and Rogers 1905; (4) *Aurococcus* Winslow and Rogers 1905; and (5) *Albococcus* Winslow and Rogers 1905.

In this scheme the present organism can be easily classified as its cells are not in capsulated pairs nor in chains, but in irregular groups. It does not ferment inulin, and it forms an orange pigment. It therefore belongs to the genus *Aurococcus*, under which Winslow and Rogers place three species, and to which we can add a fourth.

This is the point at which Winslow and Rogers's classification fails, in that they do not give sufficient details of their individual species, mentioning only a few characters.

The present coccus differs from *Aurococcus aureus* (Rosenbach 1884) in that it reduces nitrates, which *A. aureus* does not, and it ferments mannite, which *A. aureus* is usually said not to do.

It differs from *A. aurantiacus* (Cohn 1872) in that it liquefies gelatine and reduces nitrates, which the other does not.

It differs from *A. tropicus* (Chalmers and O'Farrell 1913) in the pathological lesions produced, but it was impossible a year ago to perform in this laboratory many of the reactions which can be carried out to-day.

It agrees with *A. mollis* (Dyar 1895) in that it is a parasitic coccus, occurring singly, or in pairs, or in irregular groups. Reaction to Gram is positive in both. Good surface growth of orange colour in both. Acid production in dextrose and lactose peptone media in both. Nitrate reduction in both. Will grow well at 20° C. and 37° C., and liquefy gelatine fairly rapidly.

In fact, as far as the Winslows give the reactions of this organism it agrees with the one in question. Dyar, it is true, said that it coagulated milk without forming acid, and it is correct that it does decolorize the blue litmus sometimes without turning it red, but acid is formed. It is also true that Migula says distinctly that it does not ferment lactose, whereas the Winslows distinctly say that it does. This may, perhaps, be explained as its action is sometimes slight and sometimes more marked. Unfortunately, we have been unable to refer to Dyar's original paper, and therefore are unacquainted with his own statements.

So far we are unable to distinguish between our organism and Dyar's, which was originally obtained from the air, and therefore conclude that it is *Aurococcus mollis* (Dyar 1895).

It is possible that the *Micrococcus pemphigi-contagiosi* (Clegg and Wherry 1906) should be regarded as a synonym of *Aurococcus mollis*, but unfortunately the reactions recorded are too few to make any certainty on this point, and it is also probable that *Micrococcus pemphigineonatorum* (Almquist 1891) is also a synonym of Clegg and Wherry and Dyar's organisms, but again this is uncertain for lack of details, and therefore Dyar's name holds good.

We may therefore class this causal organism as either *Micrococcus pyogenes* var. *mollis* (Dyar 1895), or as *Aurococcus mollis* (Dyar 1895), according to the nomenclature adopted.

The points in favour of this being the causal agent are:—

(1) It was the only organism present and was found in the youngest vesicles.

(2) The same organism was obtainable from all the patients.

(3) A vaccine prepared from it cured the patients quickly.

The Epidemic.—The first case was noticed on August 23, 1914, and the last case on September 5, 1914. Between these dates six cases occurred. Three men complained of the eruption; one was found infected in the hospital and two were found when the whole regiment was medically examined.

The native servants were carefully inspected, but no sign of skin disease was found in them, in the washer-people or the barber, nor could the infection be traced to any animal. The men were distributed as follows: A Company, 1; B Company, 2; D Company, 2; Band, 1; so that there does not at first sight appear to be much connection between the cases; but this is only apparent and not real.

The first man noticed to have the disease acted as groom to one of the lieutenants, and this officer was suffering from boils at the time. As one of the men, who did not receive vaccine treatment, suffered with boils as a complication and later as a sequela, and as these boils yielded at once to the same vaccine as that which cured the other cases, it would appear as though this was the origin of the infection of the first man, and that from him it spread to the others; and, being promptly diagnosed, searched for, and treated, the disease ceased to spread and died out after September 5.

The man who was in hospital suffering from malaria and who was found to be infected was also a groom, but to another officer. His relationship to the first case is therefore evident, as they could meet in the stables, and as he belongs to B Company he could easily infect the other man of that company.

The method of infection of the other men is not so evident, but as they all belonged to the same regiment and lived in the same enclosure it is not difficult to imagine possible sources of infection from existing cases.

Symptomatology.—The incubation period is unknown, but in three cases the initial lesion was a small papule on the head or chest which was so quickly followed by an outbreak of bullæ that the eruption was well developed in two days. The original small papule, in the words of the soldiers, became a pimple, but it was not possible to obtain a clear history as to whether it first became vesicular and later contained pus, or whether it remained as a vesicle.

The essential feature of the eruption was a bulla (fig. 2) arising on apparently healthy skin and measuring about 2 cm. in diameter, but associated with some much larger blebs, measuring about twice this size, and also smaller bullæ which rapidly increased in diameter.

A bulla appeared to start as a small vesicle situated in the epidermis and containing a clear, watery fluid. This vesicle rapidly increased in size until it formed a bulla, the walls of which were first tense and the contents watery, but later they became flaccid and the contents purulent.

The bulla burst, the contents escaped, and the lesion dried up and disappeared usually without forming a scab, but in the case of the larger lesions it left behind it a certain amount of dark discoloration of the skin indicating the affected area.

If a bulla was pricked it was found to have a glazed parchment-like base. The edges of the bulla were also observed to be undermined, and it was apparent that the increase in size from a vesicle or small bulla to a larger one was by the spreading outwards of the edges. If scratched, excoriations and crusts were formed, but crusty lesions were rare and when present only slightly developed.

The bullæ were situate most abundantly on the thighs, back, and chest, and less abundantly on the neck, arms, and legs, and more rarely on the face and head. The axillary and scroto-crural regions were singularly free from the disease, only one case showing a slight amount of the eruption at the margins of the axillæ.

There were no constitutional symptoms, and only a couple of cases complained of a slight amount of itching, which was probably due not so much to the eruption itself as to the rubbing of the clothing producing slightly raw areas where bullæ had burst (*vide* fig. 2). When this took place small scabs were apt to form, especially if the patient scratched the area, but they were entirely secondary in nature and not part of the true eruption.

The differential leucocyte count based on 1,000 cells was:—

Polymorphonuclear leucocytes	86·7
Mononuclear leucocytes	3·8
Large lymphocytes	4·4
Small lymphocytes	3·2
Eosinophile leucocytes	1·9
	100·0

This shows a polymorphonuclear increase probably associated with the presence of the micro-organism causing the disease. It is altogether different from the count given by Paranhos and Pedroso.

Diagnosis.—The important diagnostic characters of the eruption are the absence of constitutional disturbance, the absence of severe itching, the presence of relatively large bullæ arising from apparently sound skin and not surrounded by in-

flamed areolas, the absence of marked incidence on the axillary and scroto-crural region, the absence of crusts and of streptococci and the presence of *Aurococcus mollis*, and finally the ready reaction to treatment by a vaccine prepared from this organism.

Differential Diagnosis.—The differential diagnosis must be made from *Impetigo Contagiosa*, *Dermatitis Bullosa Plantaris*, *Pemphigus Acutus*, *Pyosis Mansoni*, and *Corlett's Impetigo Contagiosa Bullosa.*

It can readily be differentiated from *Impetigo Contagiosa* by the absence of crusty lesions as a rule, and by the fact that even when the youngest vesicle is examined by Sabouraud's methods no Streptococcus can be found and only *Aurococcus mollis*.

From *Dermatitis Bullosa Plantaris* it may be distinguished by not attacking the soles of the feet as far as has been recorded, by not extending between the toes, and by the absence of Streptococci and *Epidermophyton cruris*.

From *Pemphigus Acutus* it can be recognized by the absence of the severe constitutional disturbance and of Demme's Micrococcus.

From *Pyosis Mansoni* it can be differentiated by the fact that it does not begin in the axillæ or scroto-crural regions, and that it but rarely and then lightly attacks these parts which are the primary seat of Manson's Pyosis.

The principal feature of the eruption in Manson's disease is flattened, roundish vesicles which enlarge to the size of a small pea, while large, flabby, pemphigoid bullæ are rare; but, in the eruption we are considering, large pemphigoid bullæ are common.

In Manson's pemphigus the vesicles are often surrounded by a pinkish or reddish inflammatory halo which is absent in the present eruption.

Though it closely resembles in many particulars Manson's disorder, still to a person accustomed to see Pyosis Mansoni in Ceylon the present eruption shows a strikingly dissimilar picture, especially as Manson's Pyosis starts in areas which are damp with sweat, while this eruption does not; and Manson's Pyosis is associated with the damp, hot Tropics and often with prickly heat, while this is not associated with prickly heat.

On the other hand, it appears to correspond with *Corlett's Impetigo Contagiosa Bullosa* as far as can be gathered from Colcott Fox's abstract, as we have been unable to refer to the original paper.

They both start from an initial lesion in the shape of one or more small reddish spots, from a pin's head to a split pea in size, without fever or marked itching. They both attack robust subjects. The red spots in both become vesiculated and enlarge considerably. In both after the initial lesion the bullæ arise from apparently sound skin, and later the bullæ become flaccid and are apt to spread peripherally, and after rupture to leave a margin which may extend. In both light friable crusts or scales may form.

In both the eruption may commence on the head and may spread to the axillæ, and more extensively over the body and limbs, and in both staphylococci appear to be the causal organism. Corlett's cases were found in American soldiers in Florida, and our cases in English soldiers in Khartoum.

Although it is not possible to be certain, it seems as though Singh's cases in India were the same disease, as according to Manson they formed a small epidemic of large bullæ—often larger than hen's eggs—lasting from one to three weeks, and in twelve out of thirteen cases without constitutional disturbance or ulceration.

Castor's mild epidemic of six cases in one family in Burma may also have been due to Corlett's eruption, as the crutch or axillæ were not attacked, while the bullæ varied from the size of a pea to an inch in diameter. The disease did not affect the general health of the patients and lasted from one to three weeks, being treated locally.

Remarks on the Differential Diagnosis.—It would appear, from a study of the differential diagnosis, as though there were two distinct acute pyogenic bullous eruptions in the Tropics unattended by constitutional symptoms, and apparently due to organisms belonging to the genus *Aurococcus*, viz., *Pyosis Mansoni*, variously named Manson's Pemphigus and Pemphigus contagiosus tropicus, or more simply Pemphigus contagiosus and Corlett's eruption, which is known as Pemphigus contagiosus bullosus or Impetigo bullosa, but for which we propose the name *Pyosis Corletti*, in order to bring it into line with the nomenclature of Manson's eruption, and in order to prevent confusion with true Pemphigus, to which it is not allied, and with true Impetigo, with which it is closely allied, but differing in its clinical features and its causal agent.

Pyosis Mansoni is clearly defined and illustrated by Castellani in the second edition of the "Manual of Tropical Medicine," written by himself and one of us, and this description need not be repeated here.

Complication.—One case alone was complicated by a slight eruption of boils, and it was the same case as that which provided the only sequela.

Sequela.—When cases are not treated by vaccine therapy there appears to be a liability to boils as a sequela.

Prognosis.—The prognosis is excellent, as the disease is rapidly cured by a combination of vaccine and local therapy.

Treatment.—The best form of treatment is to prepare a vaccine which is to be administered in 200 and 450 million doses, with intervals of two to three days between each dose.

In order to expedite the cure local treatment is also useful, and this consists in pricking each blister and catching the exuding fluid on swabs dipped in 1 in 1,000 lotio hydrargyri perchloridi.

After pricking, each blister should be thoroughly disinfected with the same lotion and be dusted with some antiseptic powder, the cheapest, but not the best, being boric acid, while the same with starch should be used for dusting the clothing in order to attempt to prevent the spread of the infection.

It is interesting to note that the case which showed boils as a sequela had not been treated by vaccine therapy. He was rapidly cured of his boils

by the same vaccine as that which cured the bullæ. This point is also of importance in supporting the origin of the epidemic from a case of Furunculosis.

Prophylaxis.—The important points in the prophylaxis are to realize that the disease may originate from a case of boils, may cause no symptoms, and may be overlooked.

It is therefore necessary to treat cases of boils in the Tropics as contagious, and to carefully inspect every member of a household or regiment in which a case of Pyosis is found in order to attempt to discover unsuspected cases.

There can be no doubt that isolation and prompt treatment quickly stop an epidemic which otherwise might spread considerably and cause an amount of temporary inefficiency in a regiment.

Definition.—In order to make the position of Corlett's eruption quite clear we furnish an attempt at a definition:—

Pyosis Corletti is an acute, contagious, bullous pyosis beginning on any region of the body (but not especially affecting the axillary and scroto-crural regions), characterized by the presence of medium-sized and large bullæ arising on seemingly healthy skin, and apparently caused by Aurococcus mollis ***(Dyar 1895).***

Acknowledgment.—We have much pleasure in acknowledging the kind and valuable help rendered to us in this work by Captain O'Farrell, R.A.M.C., when one of us was partially incapacitated by a laboratory infection of the right hand.

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SINGH. Quoted in Manson's "Tropical Diseases," London, p. 847.

In addition we may mention a reference which we were unable to obtain, but which other readers might be in a position to see, and which may be useful:—

BOWEN and OTHERS (1906). "Classification, Ætiology, &c., of Bullous Eruptions." *Brit. Journ. Dermatol.*, xviii, p. 410.

ILLUSTRATIONS.

FIG. 1.—Photomicrograph of *Aurococcus mollis* (Dyar 1895) from a culture × 1,870 diameters. (This coccus was very difficult to photograph, and is slightly out of focus.)

FIG. 2.—Photograph of the thigh of a British soldier affected with Pyosis Corletti.

This only shows medium-sized bullæ and the condition arising from the rubbing of the clothing on the sites of burst bullæ. (This illustration is improved if examined with a lens.)

ASSOCIATION OF MEDICAL OFFICERS OF MISSIONARY SOCIETIES.

THE following resolution was adopted by a meeting held on Tuesday, March 16, 1915:—

"That in view of increased knowledge of the causes, treatment, and prevention of disease, which has already resulted in a remarkable diminution of sickness, invaliding, and mortality amongst all classes of Europeans in the Tropics, Missionary Societies who are represented on the Association, and others if willing to join, be requested to consider the desirability of making fresh inquiry into their furlough and leave regulations, and other measures for the preservation of health, in such a manner as to ensure the efficiency, health, and comfort of their agents, and to reduce expenditure."

It was pointed out at the meeting that very full consideration had been given to this question by the Association during recent years; and it was suggested that a Committee should be appointed of at least two representatives of each Society, one of whom should be a medical member, to draw up a report on the subject, and that the British Societies' Conference be requested to appoint such a Committee.

The following, among other questions, were suggested for consideration:—

(*a*) The relative advantages of furlough and local leave.

(*b*) The advisability of the length of furlough varying according to whether a returned missionary is doing deputation work or not.

(*c*) The importance of furlough rules being the same for different societies working in the same field.

TAGUA, the vegetable ivory nut, is the seed of the fruit of a species of palm tree, *Phytelephas macrocarpa*. It is a native of the tropical regions of Ecuador and Colombia and of the interior of Brazil. Queensland produces a similar but larger nut, distinguished by a hole through its centre.

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Tropical Medicine and Hygiene

APRIL 1, 1915.

TYPHUS FEVER, ITS CAUSE AND POSSIBLE PREVENTION.

THERE are few military campaigns in history in which typhus fever has not played a part. Armies have been stricken and campaigns prolonged or altogether lost by its virulence and persistency. The last British campaign in which typhus appeared was that of the Crimea, where both the French and British armies, and presumably the Russians, also suffered as well. In Serbia at the moment an epidemic prevails, and in Galicia its presence has been reported on several occasions recently.

In the British Isles and in countries where sanitary dwellings and hygienic habits have developed typhus is now seldom met with. Sporadic cases or circumscribed outbreaks occasionally are notified, but an epidemic has not been known for over fifty years. In London cases of typhus are now and again mentioned in the mortality returns, but so rarely has the disease been seen in the professional life of most medical men that the accuracy of the diagnosis might become a subject of discussion. Ever since 1866, when overcrowding legislation was suggested for London, typhus has gradually become well-nigh obsolete.

In some parts of the country, however, it still lingers, not necessarily in cities and villages, but in country dwellings and even in lonely wind-swept cottages on the Galway coast it develops, apparently, "spontaneously." That it can arise spontaneously is against our present-day axioms; that it is contagious seems no longer tenable; that fomites play a part in its dissemination seems also untenable, but that it is associated with, and in a manner due to, overcrowding is as undoubted as it is also allied with destitution and famine. Contact with the sick, however, does not prove a disease to be contagious, that is, that the infection travels directly from the sick to the healthy; but in this close contact vermin are ready interveners and serve to cause what is really an infection to appear as a contagion. As overcrowding favours vermin, and as destitution, poverty, and famine lead to overcrowding, so these factors have long been held to play the leading part in the spread of typhus; but that the louse, the bed-bug, or the flea—perhaps one or all of them—are the infecting agencies would seem, from analogy with other infections, in the absence of even direct proof, well-nigh certain. Which of these vermin carry the infection is not definitely settled, but with the analogy of relapsing fever infection before us, the disease may be carried by one verminous animal in one country, and in another by some other animal altogether; thus the tick in Africa and Asia carries relapsing fever, but in Europe the bed-bug is the medium of transmission. There is nothing, therefore, improbable in a district where both these insects obtain for a double channel of transmission to exist.

The parasite of typhus has yet to be found; in this it resembles yellow fever, and as that disease has been proved to be transmitted by an insect, so typhus may be ranged in a similar category.

Many observers have brought forward organisms met with in the blood or tissues of typhus fever patients. Now it is a fungus (Hallier); then a bacillus (Klebs); screw-like, motile organisms in the blood and micrococcal bodies in the heart tissues (Mott and Blore); flagellate bodies (Thoniot and Calmette); diplococci (Dubieff and Brühl, and also Balfour and Porter). These are quoted to show that research as regards the etiology of typhus has not been neglected. Nor does this exhaust the list, for still more recently we find that Horiachi, serving with Japanese troops in Manchuria during the Russo-Japanese War, isolated a bacillus in cases of typhus; and perhaps the most interesting, but not necessarily the most convincing, discovery is that by Gottschlich, who in 1903 isolated a

Babesia in typhus cases in Egypt. Krompecher, Goldzieher, and Augyân also described *Babesia* like intracorpuscular bodies in typhus.

The interest attaching to the presence of *Babesia* is due to Wilson and Chowring's discovery of a *Babesia* in cases of the spotted fever of the Rocky Mountains. The name spotted fever is familiar in Britain at present, but it is but a popular name given to cerebro-spinal meningitis; that this is associated in any way with the Rocky Mountain variety, and therefore with typhus, is a wide stretch of generalization, which we are not at present prepared to take. Yet it may be noted that a popular name for typhus is "black typhus," and that the name "black fever" is a synonym of the spotted fever of the Rocky Mountains. Sambon's reasoning, so seldom faulty, is that the Rocky Mountain form is of a typhus character and probably identical with it in cause.

Further investigations as regards typhus have proved interesting and valuable. Of these we may mention: (1) Yersin and Vassal proved (*a*) that typhus is inoculable from man to man; (*b*) the infective agent is present in the blood between the second and fifth day of the disease. (2) Nicolle, Anderson, and Goldberger succeeded in infecting monkeys by inoculation of blood taken from patients suffering from typhus. (3) Nicolle has shown that the virus is filterable.

All these point to the presence of a parasite in the blood, especially if Nicolle's filtration experiments are confirmed; and that an insect is the carrier.

We are haunted by the term "fomites" in many writings, and it is wedged in between materials, such as "bedding, fomites, furniture, and clothing." What are fomites? Reference to the dictionary shows "Fomes, pl. *fomites* [L. = tinder]. Any porous substance that absorbs and transmits a contagium." The term evidently refers to the transmitting substance, not to the agents; but as everything in nature is porous to some degree, even including solid rock by its fissure, it is surely time that this term, used to cloak ignorance really, should be expunged from medical nomenclature.

The presence of typhus may be said to diminish in intensity as we travel from the colder climates towards the Equator. Yet it is met with in tropical countries at high altitudes, where the cold of winter causes people to huddle together and where overcrowding allows of the free passage of vermin from one person to another.

There are certain countries in which typhus fever is unknown; especially is this the case in Australasia, where overcrowding is at a minimum. It would seem proved, if anything can be proved where the infecting agencies are unknown, that ventilation is effective in preventing infection, that the disease is not, therefore, air carried, but that it is close contact that is essential to infection; in other words, if it is not air carried, then it is vermin borne in all probability.

The prophylaxis of typhus would seem to be cleanliness, free ventilation, and ridding our abodes of vermin. In time of war vermin, especially lice and bugs, seem to be well-nigh a constant accompaniment. In the bedding, the bed, the body clothing, &c., vermin appear in well-nigh every army and every campaign. In war this department of hygiene has not progressed sufficiently, and it is easily understood why clothes cannot be changed at will, "beds" cannot be selected but used wherever and however presented, be they in the dwelling-houses, in the barns, or in the trenches. Yet, surely, in well-appointed armies in the future we will see disinfection and disinfecting apparatus forming part and parcel of the medical equipment. Even now in the present campaign it is not too late to send disinfecting chambers on motor vehicles to the Front where soldiers can have their clothing disinfected in a few minutes. Tons of blue ointment are being sent to our soldiers at the Front, let us send instead a portable disinfecting apparatus on a sufficiently large scale. Were this done at once the soldier would be relieved of much misery; and diseases, not only typhus, of many kinds which are conveyed by vermin would be prevented or, at any rate, reduced to a minimum.

J. C.

Translation.

THE DIRECT MICROSCOPIC LOCALIZATION OF THE TYPHOID BACILLI IN THE BLOOD OF THE PATIENT, AND ITS SIGNIFICANCE WITH REGARD TO DIAGNOSIS AND TREATMENT.

By V. A. Wille.
Samarang, Java.

(*Continued from p.* 72.)

A year and a half has elapsed since the foregoing was written, and I have thus had the opportunity of considering and testing the question more closely.

For the exhibition of dry preparations I have latterly used Burri's [3] method instead of staining with fuchsin: A small droplet of blood is carefully mixed on the slip with a droplet of "Perle-Tusch" (Indian ink) of equal size, and is then spread with another ground slip in the usual way. The preparation is fixed with alcohol. This method is very easy, and the bacilli stand out very nicely and distinctly on the dark background. I have recently seen that Hermann Bley has detected paratyphoid bacilli in the blood of mice by this method.

We must constantly keep in view the fact that we cannot ascertain the bacteriological diagnosis through the microscopic examination alone. The morphological examination can only tell us that we have to do with a typhoid-like bacillus.

I will describe one more case of typhoid from Semarang, Java, as some of the accompanying photomicrographs have been taken from the blood of this patient.

Case 17.—Miss B., aged 25. Illness began on August 8, 1913, with vomiting and fever, five days in bed, then up again,

but patient did not feel well. Went a journey. Came under my treatment August 20, temperature between 38° and 39° C. Numerous typhoid bacilli were found in the blood, the number was forty-four in ten fields by 570 times enlargement, and the Widal reaction was strongly positive. The spleen extended to the costo-clavicular line. She was kept in bed on typhoid diet. The course of the disease was favourable. She was cured about September 20.

An objection which may be raised to my observations is that they do not agree with the result of the bacteriological blood examinations. These, we know, have given the following results. In slight cases of enteric fever they are often negative during the whole course of the disease; in severe cases they are nearly always positive in the first week, in the second week positive in scarcely 50 per cent. of the cases, in the third week still more often negative, and during convalescence always negative. On the other hand, by direct microscopical examination I have found typhoid-like bacilli in the blood during the entire course of the disease and for a long time after it was cured, both in slight and severe cases. This apparent contradiction, however, is very easy to explain. The fact is, that what we learn from the culture-proofs is not whether the blood upon the whole contains bacilli, but whether it contains bacilli that have sufficient living and breeding power to develop and produce colonies on the different nutritive media. And, as we know, the bodily reaction against the disease, its whole bactericidal apparatus, will develop more strongly every week that passes after the commencement of the disease.

For instance, the agglutinin often does not attain its full development till during the third week, and that, we know, is the reason the Widal reaction often fails at the beginning of the disease, while it gives a strongly positive result later on. The bacilli contained in the blood are, of course, specially exposed to the influence of the different bactericidal substances, and I have, as mentioned above, frequently observed the agglutination of the bacilli directly in the blood. In this way it is quite simply explained, that the bacilli during the later run of the disease and during convalescence, although still present in the blood, have been weakened so much under the influence of these different poisons that they are not able to live and breed on the different nutritive media. I am not alone in this view. Lately, for instance, I saw the following statement by Professor Hans Ziemann [8] : "Dies sei auch der Grund für die vielen negativ verlaufenden Versuche der Typhus-blut-kulturen in letzten Stadium des Typhus, da dann grosse Mengen von Ambozeptoren sich fänden, während die Kulturen in den ersten Fiebertagen der Erkrankung gewöhnlich erfolgreich waren."

As I have frequently found bacilli in the blood after the patient had recovered, it was obviously necessary to ascertain whether they were often found in healthy persons. Therefore, a short time before I left Java (in November, 1913), I took blood samples from all the sixty-six Javanese eye patients, both men and women, who at that time were in-patients in the Salvation Army Eye Hospital, Semarang, of which I have charge. As I had no time to make the examinations immediately, but had to wait until I came to Europe, it was necessary to use dry preparations. I therefore chose Burri's method, which proved very practical.[1]

These examinations gave the following result: Out of sixty-six persons fifty-two gave positive reactions, thus 78·75 per cent. The number of bacilli was as follows:—

Below	5	bacilli in 10 fields in	5	persons.
From	5-9	,, ,,	11	,,
,,	10-14	,, ,,	10	,,
,,	15-19	,, ,,	13	,,
,,	20-24	,, ,,	10	,,
,,	25-29	,, ,,	2	,,
Above	30	,, ,,	1	,,

Agglutination of some of the bacilli was observed in forty persons.

The large percentage of positive cases and the considerable number of bacilli found in many of the persons examined may be surprising. I had been prepared for something of the kind. Experienced tropical practitioners, we know, have often been surprised by seeing the native population live and thrive under such fearful hygienic conditions that we should expect widespread epidemics of typhoid. They have tried to explain this by the fact that the whole population must have become immunized against the disease, perhaps through slight, or severe attacks. Sir Patrick Manson [7], for instance, has written as follows: "And yet, in such circumstances—in which the sanitarian would prophesy typhus and typhoid—the population seems to thrive. Doubtless, where the European would almost surely contract typhoid and other filth diseases, the natives have obtained an immunity." The conclusion the celebrated tropical pathologist draws here seems to be confirmed in a rather striking way by this microscopical examination of the blood.

I had another reason for expecting many positive cases. The fact is, that in Batavia, in 1912, Dr. A. A. Hulshoff made an examination of 120 healthy natives for the typhoid Widal reaction with the following result:—

Hulshoff stated: "Uit de tabel blijkt dus, dat bij 120 willekeurige, gezonde Batavianen gevonden werd:—

Agglutinatie	1:150 bij	9 personen	=	7½ prozent.
,,	1:100 ,,	18 ,,	=	15 ,,
,,	1:50 ,,	26 ,,	=	21½ ,,

Uit mijn onderzoek bleek verder, dat een positieve agglutinatie op paratyphus B bacillen minder frequent voorkwam dan positieve typhus-agglutinatie en dan

[1] The preparations from the blood of the Javanese people were made in this way. The finger was disinfected with tincture of iodine, a lot of new sewing needles were sterilized in flame; each needle was used for one patient only, each slide was carefully cleansed with alcohol, and to bring the droplet of Indian ink from the bottle to the slide and mix it there with the droplet of blood from the patient a new stick was used for every patient.

The preparations for Europe were made in the following way: The finger was cleansed with alcohol, the same needle was used for all the patients, but it was sterilized every time after it had been used; the glass-sticks, used for bringing the Indian ink from the bottle to the slide, were carefully cleansed with tampons saturated with alcohol before being used again. The slides were cleansed in the same way. Three different bottles of the Indian ink, "Perle-Tusch," were used.

steeds een vell zwakkeren titer vertoonde, dan de gelijktijdige typhus-agglutinatie. . . . In elk geval blijkt uit deze waarnemingen, dat een vrij groot percentage gezonde Inlanders uit Batavia een positieve reactie van Widal vertoont, die niet mag worden toegeschreven dan een gelijktijdige paratyphus-agglutinatie van hoogeren titer, en lijkt mij de conclusie niet gewaagd, dat onder de Inlanders te Batavia typhus een vell voorkomende ziekte is."

As we see, Dr. Hulshoff found the Widal reaction positive in 44 per cent. of the cases.

In judging the results of the microscopical examination of the blood of the sixty-six Javanese eye patients from Semarang we must also consider that possibly there may have been slight, ambulant cases of typhoid among them. Time and circumstance prevented me from controlling them as carefully as I should have wished.

After my return to Europe it was obvious that I should examine the blood of some healthy persons here. It was reasonable to expect quite another result to that obtained in Java, seeing that the sanitary conditions in Europe usually are so much better. Further, in Europe an examination of the Widal reaction in healthy persons has given quite a different result to that of Dr. Hulshoff in Batavia. I am referring to the examination of Dr. Dennemark, [4]. Among 452 healthy persons, who had been living in close communication with typhoid patients. he found ninety-eight with a positive Widal reaction; among 250 "völlig unverdächtigen Personen" (completely unsuspected persons) he, however, only found five with a positive reaction.

Time and circumstances did not allow of such an extensive examination. I had to be satisfied with examining fifty healthy persons, men and women, chosen indiscriminately. The result, made in Copenhagen, was as follows:—

Among 50 persons 25 gave a positive result = 50 per cent.

The numbers of the bacilli were as follows:—

Less than 5 bacilli in 10 fields in 20 persons.
From 5-9 bacilli in 10 fields in 5 persons.

Agglutination was not observed.

It is rather surprising that typhoid-like bacilli have been found in the blood in half the cases. The result, however, is very different from that of the Javanese in Semarang, especially when considering the number of the bacilli. We learn in the first place from this examination that the detection of less than five typhoid-like bacilli in ten fields (by 570 times enlargement) has no diagnostic significance. On the other hand is the fact that in none of the persons examined have more than nine bacilli been found in ten fields. Therefore, if in Denmark we should find a considerably greater number of typhoid-like bacilli in the blood of a patient, it would be an indication either that he has typhoid, or has had this disease.

Considering how often I have found typhoid-like bacilli in the blood of healthy persons, we cannot but ask ourselves whether there should really be so many bacillus carriers. This supposition would certainly be a great mistake. A bacillus carrier, we know, means a person the fæces and urine of whom contain typhoid bacilli with living and breeding power, and bacteriological examination would be necessary for detecting this fact. That the blood can contain numerous bacilli, while the bacteriological examination of urine and fæces simultaneously give a negative result, can be seen from the following three cases, which Professor Feilberg, the Senior Physician of Oresundshospital, Copenhagen, kindly gave me permission to observe and describe:—

Case 18.—Thomas H., aged 15. Taken ill on January 2, 1914. Typical typhoid symptoms and fever curve. No fever after February 3. January 24: Widal, typhoid + 1/25, 1/50, 1/125, 1/250; paratyphoid negative. March 3: Fæces and urine = typhoid bacilli. March 10: Microscopical examination of the blood (Burri), 45 bacilli in 10 fields. Some of the bacilli were agglutinated, a fact which, in addition to the positive result of the Widal reaction, seemed to show that they really were typhoid bacilli.

Case 19.—Julius H., aged 13, brother of the above. Taken ill January 2. Typical typhoid symptoms and fever curve. No fever from February 8. January 24: Widal, typhoid + 1/25, 1/50, 1/25, 1/250; paratyphoid negative. March 3: Fæces and urine = typhoid bacilli. March 10: Microscopical examination of the blood (Burri), 28 bacilli in 10 fields, some of them agglutinated.

Case 20.—Ellen M. L., aged 11. Taken ill about January 20. Typical typhoid symptoms and fever curve. February 25: No fever; at present (about March 10) there is a slight rise of temperature again. January 25: Widal, typhoid + 1/25, 1/50 slight, – 1/125, 1/250, paratyphoid negative. February 21: Fæces and urine = typhoid bacilli. March 10: Microscopical examination of the blood (Burri), 37 bacilli in 10 fields, some of them agglutinated.

In finishing the work I decided, if the respective senior physicians would give their consent, to examine all the typhoid patients at that time (March, 1914) in the hospitals in Copenhagen. It certainly spoke in favour of the sanitary conditions in Copenhagen, that there were only two cases to be found besides the three patients mentioned above. I have also to thank Professor Feilberg for these two medical records. Their contents briefly are as follows:—

Case 21.—Caroline L., aged 45. Taken ill about January 1. Typical typhoid symptoms and fever curve. From February 23 to March 1, temperature about 37° C., running up later on, and from March 5, 38·8° C. in the evening. January 30: Widal, typhoid + 1/25, 1/50, 1/125, – 1/250 paratyphoid –. March 10: Microscopical examination of the blood (Burri), 33 bacilli in 10 fields, some of them agglutinated.

Case 22.—Ellen O., aged 26. Taken ill January 31. Typical typhoid symptoms and fever curve. February 25: Feeling well. February 21: Widal, typhoid + 1/25, 150, slightly + 1/125, 1/250; paratyphoid negative. March 10: Microscopical examination of the blood (Burri), 21 bacilli in 10 fields, some of them agglutinated.

I am reporting one more case from the same hospital, but from a later period. The special interest of this case is that the Widal reaction had been twice negative, while the result of the microscopical examination of the blood was so distinct that I thought I should be able to prove that the case in question was a bacillus infection of the coli group, probably the typhoid bacillus. The following day this diagnosis was confirmed by the bacteriological examination of fæces. A fortnight later the Widal reaction was positive.

Case 23.—C. O. W., aged 36, moulder. September 23, 1914, he went to another hospital and was admitted. September 26: Widal, typhoid negative; paratyphoid negative. October 3: Widal, typhoid negative. Transferred to the Oeresunds Hospital.

Typical typhoid symptoms, with the exception of an eruption of doubtful nature. October 10: Microscopical examination of fresh liquid blood. In 10 fields 5 motile, 6 immovable typhoid-like bacilli, besides 3 × 2 agglutinated and 6 phagocytes. October 8: Fæces + typhoid bacilli; von Pirquet negative. October 21: + agglutinated, 1/25 typhoid, = agglutinated 1/10, paratyphoid.

I add a short *résumé* of the last part of the paper:—

(1) The Burri method is very useful for the microscopical localization of typhoid-like bacilli in the blood.

(2) In healthy Danish people typhoid-like bacilli were certainly found in 50 per cent. of the cases examined, but in very small quantities, whereas in apparently healthy Javanese they were found in 78·76 per cent. of the cases, and in much greater quantities.

(3) Bacilli in the proportion of less than five in ten fields (enlargement 570) are of no significance as to the diagnosis, whereas when the number is considerably greater our attention must be drawn to them.

(4) A person may have numerous typhoid bacilli in his blood without being what is understood as a "bacillus carrier."

I must mention that during the microscopical examinations of fresh, liquid blood, described in the first part of the paper, I also observed phagocytosis. It was my intention to describe these observations, but I have been forced to abandon the idea as the drawings, necessary for the representation, have been lost by an accident, and cannot be replaced for the time being.

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Medical News.

SMALL-POX, VACCINATION, AND THE NEW VACCINATION LAW IN SIAM.

SMALL-POX is endemic in Siam, and a cycle of epidemicity would seem to occur every three or four years. During December and January, the two coolest months of the year, half the cases occur. It is not possible to ascertain the actual number of deaths from small-pox throughout the country, but amongst a few hundreds of cases recorded by Dr. Highet, Principal Medical Officer, Local Government, Siam, the death-rate amounted to 55 per cent. In Bangkok 67·2 per cent. of the deaths from small-pox occurred in children under 10 years of age.

In the middle of last century vaccination was introduced, but, owing to the difficulty of getting vaccine material, inoculation was practised, and it was not until 1904 that a vaccine laboratory was established. In 1906 the work was extended, and a serum and vaccine laboratory was installed, and later (in 1912) this was merged in the present Pasteur Institute. Although excellent work was accomplished in the laboratory and many doses of vaccine issued and used, it was found that small-pox still levied a heavy toll upon the infants of Siam, and the voluntary system of vaccination proved inadequate. Before, however, general vaccination could be enforced, it was necessary not only to have a sufficient quantity of vaccine available, but also a requisite number of trained vaccinators. Moreover, the people had been persuaded and encouraged to periodic vaccination and to bring their children to the vaccinator at an early age; for, amongst children of under 1 year of age, no less than a quarter of the total deaths from small-pox occurred.

The new law that vaccination against small-pox shall be compulsory was introduced in February, 1914; at present it holds good in the Bangkok province only, but it may be extended to any other province at any time. The provisions of the law are in accordance with vaccination laws in other countries; no "conscientious objector" is recognized; the Siamese are a people advancing in civilization, and have not yet developed the reversion degenerates met in Britain who attempt to strangle any established principle of health which is known to benefit mankind.

We congratulate the Siamese Government and Dr. Campbell Highet upon this important and wise act of legislation by which the greatest scourge of their country will be eradicated, provided always the powers assumed are rigidly enforced.

Review.

A TREATISE ON HYGIENE AND PUBLIC HEALTH, WITH SPECIAL REFERENCE TO THE TROPICS. By Birenda Nath Ghosh, L.M.S. (Cal. Univ.) and Jahar Lal Das, L.M.S. (Cal. Univ.). With an Introduction by Colonel Kenneth MacLeod, M.D., LL.D., F.R.C.S., Indian Medical Service (retired). Second Edition. Hilton and Co., Calcutta. 1914. Price 6s. net.

This work is of special interest, representing as it does the views of natives of India on hygiene and public health. It is a most useful manual for all

connected with the Tropics to appreciate the standpoint of modern Orientals embued with due regard to the precedence of their own country. There is, unfortunately, far too great a gulf between the mind of the East and the mind of the West, which is hard to bridge over, though this book is a step towards the desired end. In medicine and sanitation from Suez to Japan the differences, from the European standpoint, are matters of detail more than main principles.

To consider the work in detail every matter pertaining to the subject under consideration is fully dealt with, commencing with water, air, ventilation, and not least cooling.

Soil, houses and buildings of all varieties, their advantages and disadvantages, are discussed; also food with diet in India, where, as is only natural, vegetable precede animal foods. Then beverages and condiments, the non-fermented preceding the fermented ones.

Chapters IV, XII, and XIII deal with offensive trades, and who does not know of these and think of Cologne? Then refuse, its collection, disposal and removal. Sewage receives its due meed of consideration.

Standing by itself is disposal of the dead, commencing with cremation, the cost being given at 6s. Not only is it cheap, but it also prevents pollution of soil and water, and if properly carried out is quite sanitary. Climate and meteorology are considered from the Indian standpoint.

Chapters are devoted to infection, beginning with the consideration of inoculation, where there is no mention of British fads, which would appear to be inconceivable to the mind of cultured Orientals. Due attention is paid to restraint of infection, so important in the cataplasmal catastrophes of plague and cholera.

That the authors appreciate all facts connected with kala-azar and beriberi gives reason to hope that all possible steps may be taken for their eradication.

Notes and News.

THE FALLING DEATH-RATE.

In the report of the Medical Officer of Health of the Local Government Board the fall in the death-rate in England and Wales during 1913 amounted to no less than 25 per cent. as compared with the returns for the years between 1891-1900.

Comparing the death-rate averages during 1913 with the period between 1891-1900 for certain diseases it will be seen that the decline during 1913 amounted in measles to 32 per cent.; scarlet fever, 64 per cent.; whooping-cough, 62 per cent.; diphtheria and croup, 55 per cent.; enteric, 77 per cent.; tuberculosis, 33 per cent. (pulmonary tuberculosis, 28 per cent.).

In puerperal ailments the decline amounted to 27 per cent.; and infantile statistics show that the mortality during 1913 fell 29 per cent. as compared with the period 1891-1900.

Personal Notes.

Colonial Medical Services.

West African Medical Staff.

Death.—J. Atkinson, M.B., Ch. & B.Glas.

Transfers and Promotions. — H. B. S. Montgomery, L.R.C.S. & P., Provincial Medical Officer, Gold Coast, has been transferred on promotion to Nigeria as Deputy Principal Medical Officer. J. W. Collett, M.D., L.R.C.P. & S.Edin., L.F.P.S.Glas., Senior Medical Officer, Sierra Leone, has been transferred on promotion to Nigeria as Provincial Medical Officer; D. Burrows, L.R.C.P. & S.Edin., L.F.P.S.Glas., Senior Medical Officer, Nigeria, has been transferred on promotion to Sierra Leone as Provincial Medical Officer. E. C. Adams, M.R.C.S.Eng., L.R.C.P.Lond., L.S.A.Lond., Medical Officer, Nigeria, has been transferred on promotion to the Gold Coast as Senior Medical Officer; T. F. G. Mayer, M.R.C.S. Eng., L.R.C.P.Lond., Medical Officer, Gambia, has been transferred on promotion to Sierra Leone as Senior Medical Officer. F. J. A. Beringer, M.R.C.S.Eng., L.R.C.P.Lond., D.P.H.Ireland, Medical Officer, Gold Coast, has been transferred on promotion to Sierra Leone as Sanitary Officer. E. W. Graham, M.B., C.M.Glas., Senior Medical Officer, Gold Coast, has been promoted to be Provincial Medical Officer. T. B. Adam, L.R.C.P. & S.Edin., L.F.P.S.Glas., D.P.H. Ireland, Captain J. B. Bate, R.A.M.C. (T.F.), M.D Durham, L.S.A.Lond., D.T.M.Liverpool, G. Hungerford, L.R.C.S. & P. Ireland, G. R. Twomey, M.D., C.M.Edin., R. W. Gray, M.B., C.M.Edin., D.P.H.Camb., E. H. Tipper, M.R.C.S.Eng., L.R.C.P.Lond., L.S.A.Lond., and H. G. McKinney, M.R.C.S. Eng., L.R.C.P.Lond., Medical Officers, Nigeria, have been promoted to be Senior Medical Officers; F. S. Harper, M.B., C.M.Edin., C. D. Ralph, M.R.C.S.Eng., L.R.C.P.Lond., and C. V. Le Fanu, M.B., Ch.B.Aberd., D.T.M.Liverpool, Medical Officers, Gold Coast, have been promoted to be Senior Medical Officers; C. H. Allan, L.S.A.Lond., Medical Officer, Sierra Leone, has been promoted to be Senior Medical Officer. A. C. Lorena. L.R.C.P. & S.Edin., L.F.P.S.Glas., D.P.H. Ireland, Medical Officer, Gold Coast, has been promoted to be Sanitary Officer.

Retirements.—M. F. Ellis, M.A.Camb.,L.R.C.S. & P.Edin., L.F.P.S.Glas., retires on pension; B. Knowles, M.B., Ch.B. Aberd., D.T.M.Liverpool.

New Appointment.—E. B. Bate, M.B., B.Ch.Dublin, Gambia.

The services of the following officers of the West African Medical Staff have been placed at the disposal of the War Office: J. B. Bate, M.D.Durham, L.S.A.Lond., D.T.M.Liverpool; Captain R.A.M.C. (T.F.). D. T. Birt, M.B., B.S. Durham; temporary Lieutenant R.A.M.C. G. J. W. Keigwin, L.R.C.S. & P.Edin., L.F.P.S.Glas., L.S.A.Lond.; temporary Lieutenant R.A.M.C.

The services of the following officers of the West African Medical Staff have been placed at the disposal of the Admiralty: M. B. Hay, M.R.C.S.Eng., L.R.C.P.Lond., D.P.H.Lond.; temporary surgeon, R.N. J. C. Watt, M.B., Ch.B.Glas.; temporary surgeon, R.N.

Other Colonies and Protectorates.—C. M. Rolston, M.D. Manitoba, L.R.C.P. & S.Camb., L.R C.P. & S.Glas., has been selected for appointment as a Supernumerary Medical Officer in the Leeward Islands; J. H. Rankin, B.M., M.S.Glas., D.P.H.Camb., has been selected for appointment as temporary Medical Officer in St. Lucia; A. MacDonald, M.D., C.M. Edin., D.P.H.Manc. Vict., Medical Officer of Health, Kingston, Jamaica, has been selected for appointment as Medical Officer in charge of Ankylostomiasis work in Grenada; F. T. Auden, M.D., C.M.Edin., has been selected for appointment as District Commissioner and Medical Officer at Caicos in the Turks and Caicos Islands; J. G. Lessey, L.R.C.S. & P.Edin., L.R.F.P.S.Glas., has been selected for appointment as Resident Surgeon of the Colony Hospital, Grenada; N. H. Bolton, M.D., B.Ch.Edin., F.R.C.S.Edin., D.T.M. & H.Edin. has been selected for appointment as a Medical Officer, Zanzibar.

Original Communications.

NOTE ON A VIBRIO (*VIBRIO KEGALLENSIS* CAST., 1913) ISOLATED FROM CASES OF PARACHOLERA.

By Aldo Castellani, M.D.

Director Government Clinic for Tropical Diseases, Colombo, Ceylon.

During the last eighteen months there have been numerous cases of cholera in Ceylon, from which Koch's typical *Vibrio choleræ* was isolated. In two cases, however, a vibrio was grown which, though culturally extremely similar to true cholera, was biologically different, as was shown by agglutination and absorption tests. The same vibrio was isolated from the water of a well near which several cases of cholera-like disease had occurred. Of this vibrio, which I have called *V. Kegallensis*, I have therefore three strains, which I will designate as Strain 1, Strain 2, Strain 3, all of which, as will be shown presently, are biologically identical.

Strain 1 (see Table I).

This strain was isolated from the stools of a patient in Kegalle, showing all the symptoms of cholera: profuse serous diarrhœa, severe muscular cramps, &c. The microscopical and cultural characters of the germ are as follows:—

Microscopical.—Films from the stools stained with diluted fuchsin contained numerous vibrios, the same shape as the true cholera one, but perhaps slightly larger and thicker.

Motility.—The vibrio is very motile, like the cholera vibrio.

Staining Reactions.—Easily stained by the usual aniline dyes, Gram-negative.

Cultural Characters.—On agar and gelatine the growth had a certain resemblance to true cholera. Gelatine is liquefied. Serum is also liquefied. Milk is rendered acid and clotted. Table I gives the principal cultural characteristics and sugar reactions of the micro-organism.

Agglutination.—This vibrio is not agglutinated by true cholera serum. It is well agglutinated by Strain 1, Strain 2, and Strain 3 sera.

Pathogenicity.—I have not succeeded in reproducing the disease in the lower animals.

Strain 2 (see Table II).

This strain was isolated from the intestinal contents of a native who died after a short illness characterized by serous diarrhœa, vomiting, severe muscular cramps, &c., like true cholera.

Microscopical and Cultural Characters.—Microscopical: The vibrio is morphologically similar to Strain 1. Cultural characters: These are collected in Table II.

Agglutination.—It is agglutinated by cholera serum. It is well agglutinated by Strain 1 and Strain 2 serum.

Strain 3 (see Table III).

This strain was isolated from the water of a well in Matale, near which a small epidemic of cholera-like cases occurred. Unfortunately no stools of the cases were sent to me, but a sample of water collected with all precautions and packed in ice was sent to me. The well, being considered to be the cause of the epidemic, was closed, and the epidemic ceased.

Microscopical.—The vibrio is morphologically similar to Strains 1 and 2.

Cultural Characters.—These are collected in Table III.

Agglutination.—It is not agglutinated by cholera serum, while it is agglutinated by Strain 1 and Strain 2 sera.

Remarks on the Cultural Characters of above Strains and the true Vibrio Choleræ.

The cultural characters of the three strains are practically identical with each other, though occasionally minor, inconstant, differences may be noted. They are extremely similar to various strains of true cholera. In Table IV (p. 87) are collected the cultural characters of the three strains of *V. Kegallensis*, the cultural characters of a cholera-like vibrio found in canal water in Colombo (*V. insolitus* Cast., 1913) biologically different from *V. Kegallensis* and true cholera, and the cultural characters of six strains of biologically true cholera derived from various sources. It will be seen that the three strains of *V. Kegallensis* did not produce indol, but, in my experience one comes occasionally across a strain of true cholera which only produces a very slight amount of indol or none at all. It will be seen also that *V. Kegallensis*, as a rule, does not produce a very distinct pellicle in peptone water, but in my experience this is also the case, though rarely, with certain strains of true cholera. As regards the production of hæmolysis, this is very inconstant with all the strains of *V. Kegallensis*.

Agglutination Reactions of Vibrio Kegallensis.—Rabbits were inoculated with the three strains, and the serological reactions compared with each other and with true cholera. The results are seen in the following table:—

Table V.

Sera	Agglutination limits with			
	Strain 1	Strain 2	Strain 3	True cholera vibrio
Kegallensis Strain 1 serum ...	2,000	2,000	1,800	0
,, ,, 2 serum ...	2,000	2,000	2,000	0
,, ,, 3 serum ...	2,000	2,000	1,800	10
True cholera serum (Berne)...	10	20	20	4,000

Absorption Tests.—Absorption tests give results confirming those obtained by agglutination reactions, the conclusion being that the three strains are

TABLE I.

	Litmus milk	Lactose	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrine	Raffinose	Arabinose	Adonite	Inulin	Galactose	Sorbite	Lævulose	Inosite	Salicin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indol	Vog-s-prosk	Redn.-nitrates	Neutral red	Gram	Gelatine	Serum	Broth	Peptone water
V. Kegallensis (Strain 1) ..	AsPc	$\frac{A}{Alk}$	A	O	A	A	A	Avs	O	A	O	O	A	O	A	O	$\frac{O}{A}$	$\frac{O}{A}$	O	O	$\frac{O}{A}$	O	O	O	O	O	+	+	T	T

Abbreviations used in the table.—A, acid; T, turbidity; vs, very slight; $\frac{O}{A}$, negative then acid; $\frac{A}{Alk}$, acid, then alkaline; Pc, upper portion peptonized and clot at the bottom; O, negative result, viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non-production of indol; non-liquefaction of gelatine or serum, as the case may be; +, positive result, liquefaction of medium.

TABLE II.

	Litmus milk	Lactose	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrine	Raffinose	Arabinose	Adonite	Inulin	Galactose	Sorbite	Lævulose	Inosite	Salicin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indol	Voges-prosk	Redn.-nitrates	Neutral red	Gram	Gelatine	Serum	Broth	Peptone water
V. Kegallensis (Strain 2) ...	AsPc	A	A	O	A	A	A	A	$\frac{O}{Alk}$	A	$\frac{O}{Alk}$	$\frac{O}{Alk}$	A	$\frac{O}{Alk}$	A	$\frac{O}{Alk}$	$\frac{O}{Alk}$	O	O	O	O	O	O	O	O	O	+	+	GTP	T

Abbreviations used in the table.—A, acid; T, turbidity; $\frac{O}{Alk}$, negative then alkaline; C, clot (milk), clear (broth, and peptone water); P, pellicle (broth), peptonized (milk); s, slight; Pc, upper portion peptonized and clot at the bottom; O, negative result, viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non-production of indol; non-liquefaction of gelatine or serum, as the case may be; +, positive result, liquefaction of medium.

TABLE III.

	Litmus milk	Lactose	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrine	Raffinose	Arabinose	Adonite	Inulin	Galactose	Sorbite	Lævulose	Inosite	Salicin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indol	Voges-prosk	Redn.-nitrates	Neutral red	Gram	Gelatine	Serum	Broth	Peptone water
V. Kegallensis (Strain 3) ...	AsPc	Avs	A	O	A	A	A	Avs	$\frac{O}{Alk}$	A	O	O	Avs	O	A	O	O	O	O	O	O	O	O	O	O	O	+	+	GTP	T

Abbreviations used in the table.—A, acid; C, clot (milk), clear (broth and peptone water); T, turbidity; P, pellicle (broth), peptonized (milk); s, slight; vs, very slight; Pc, upper portion peptonized and clot at the bottom; $\frac{O}{Alk}$, negative then alkaline; O, negative result, viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non-production of indol; non-liquefaction of gelatine or serum, as the case may be; +, positive result, liquefaction of medium.

TABLE IV.

	Motility	Litmus Milk	Lactose	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrine	Raffinose	Arabinose	Adonite	Inulin	Galactose	Sorbite	Laevulose	Inosite	Salicin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indol	Voges-prosk	Redn.-nitrates	Neutral red	Gram	Gelatine	Serum	Broth	Peptone water
V. Kegallensis, Strain 1 ...	+	AsPc	A/Alk	A	O	A	A	A	Avs	O	A	O	O	A	O	A	O	O/A	O/A	O	O	O/A	O	O	O	O	O	+	+	T	T
,, ,, 2 ...	+	AsPc	A	A	O	A	A	A	A	O/Alk	A	O/Alk	O/Alk	A	O/Alk	A	O/Alk	O/Alk	O	O	O	O	O	O	O	O	O	+	+	GTP	T
,, ,, 3 ...	+	AsPc	Avs	A	O	A	A	A	Avs	O/Alk	A	O	O	Avs	O	A	O	O	O	O	O	O	O	O	O	O	O	+	+	GTP	T
V. insolitus	+	AsPc	Avs	A	O	A	A	A	A	O	A	O	O	A	O/Alk	A	O/Alk	O/Alk	O	O/Alk	O/Alk	Avs	O	O	O	O	O	+	+	GTP	T
True cholera, Strain 1 (Saigon)	+	As	As	A	O	A	A	A	Avs	O	O	O	O	A	O	A	O	O	O	O	O	O/Avs/Alk	+	O	+	O	O	+	+	GTP	T
,, ,, 2 (Ceylon)	+	As/O	Avs/Alk	A	O	A	A	A	A	O	O/Alk	O	O	A	O	A	O	O	O	O	O	O/Avs	+	O	O	O	O	+	+	GTP	GTP
,, ,, 3 ,,	+	A	A	O	Alk	A	A	A	Avs	Alk	Avs	Alk	Alk	A	Alk	A	Alk	Alk	Alk	Alk	Alk	O	+	O	+	O	O	+	+	GTP	P
,, ,, 4 ,,	+	AC	A	A	Alk	A	A	A	A	Alk	O	Alk	Alk	A	Alk	A	Alk	Alk	Alk	Alk	Alk	O	+	O	+	O	O	+	+	GTP	P
,, ,, 5 ,,	+	AC	As	A	Alk	A	A	A	O	Alk	Alk	Alk	Alk	A	Alk	A	Alk	Alk	Alk	Alk	Alk	Alk	+	O	+ / +	O	O	+	+	GTP	P
,, ,, 6 ,,	+	A	As	A	Alk	A	A	A	Avs	Alk	Avs	Alk	Alk	A	Alk	A	Alk	Alk	Alk	Alk	Alk	O	+	O	+	O	O	+	+	GTP	P
,, ,, 7 ,,	+	A	A	O	Alk	A	A	A	O/Avs	Alk	O/Avs	Alk	Alk	A	Alk	A	Alk	Alk	Alk	Alk	Alk	Alk	+	O	+	O	O	+	+	GTP	P

Abbreviations used in the table.—A, acid; C, (clot) milk, clear (broth and peptone water); T, turbidity; P, pellicle (broth) peptonized (milk); s, slight; vs, very slight; Po, upper portion peptonized and clot at the bottom; $\frac{O}{Alk}$, negative then alkaline; O, negative result; $\frac{A}{Alk}$, acid then alkaline; Alk, alkaline; GT, general turbidity, viz., neither acid nor clot in milk, neither acid nor gas in sugar media, non-production of indol, non-liquefaction of gelatine or serum, as the case may be; +, positive result, liquefaction of medium.

identical and represent one single species, and that they differ from true cholera.

Pathogenicity.—Was the vibrio the real cause of the two cases of cholera-like disease? The fact that it was present in extremely large numbers and was the only vibrio present is rather in favour of it, though I have been unable to reproduce a cholera-like disease in the lower animals (monkeys and rabbits) by feeding experiments.

CONCLUSIONS.

(1) From two cases of clinically cholera-like disease, and from the water of a well near which several cases had occurred, a vibrio was isolated which is biologically different from the true *V. cholcræ.* In a preliminary note, published some time ago, referring to the first case alone, I named it *V. Kegallensis* Cast., 1913.

(2) Though its pathogenicity has not been completely proved, the probabilities are, in my opinion, that it is the cause of certain cases of cholera-like disease, or "paracholera."[1]

SPINAL ANALGESIA IN NATIVE PRACTICE.

By A. YALE MASSEY, B.A., M.D., C.M.Tor.,
Lusambo, Belgian Congo.

FOR more than three years I have been employing stovaine injected into the spinal theca for all operations below the umbilicus, such as inguinal hernias, elephant scrotums, castrations, necrosis of bone, amputations, curetting in blastomycosis, &c. In native hospital practice it is the method *par excellence.* It would be difficult to over-estimate its value on the *morale* of the patient. There is no dread of an operation such as is caused by chloroform, and the friends do not witness the resistance and strugglings so often met with in chloroform anæsthesia. There is always a certain horror of losing consciousness even among white people, and it is much more so among the superstitious and uncivilized blacks. The technique

[1] I shall be very pleased to send cultures of *V. Kegallensis* to anyone interested in the subject.

is not difficult, especially for those who are accustomed to lumbar puncture in the diagnosis of certain tropical diseases, such as the advanced period in sleeping-sickness.

(1) *Site of Puncture.*—Any of the lumbar interspaces, preferably between the third and fourth or second and third spines. Tuffier's line—an imaginary line joining the highest points of the iliac crests—falls between the third and fourth lumbar spinous processes. I think it is immaterial which space is chosen; failure in one may necessitate trial in another.

(2) *Needle.*—Most medical men in the Tropics, especially in Central Africa, are provided with long needles for lumbar puncture diagnosis of advanced cases of sleeping-sickness. These are of steel or platino-iridium about 3 in. in length, and the calibre is sufficiently large. The steel ones, although more difficult to keep clean, are much firmer and less liable to break or bend than those of platino-iridium. I have found these needles well suited to the stovaine injections. I have never enjoyed the luxury of a needle provided with a cannula, but I can quite imagine that it possesses advantages over the simple needle. It is very rare that the simple needle becomes blocked or does not enter the theca properly.

(3) *Mode of Puncture.*—Place the patient in a sitting posture on the side of the operating table. Approach his head as near to his knees as possible, arching the back. In this way the spinous processes are separated and the entrance of the needle facilitated. Choose the space, paint the region with tincture of iodine, wash the hands carefully, puncture the skin with the sharp point of a scalpel (it is difficult to puncture the native skin with a needle), seize the needle, previously sterilized by holding in the flame of a spirit lamp, and pass it in at right angles or in a slightly upward direction. At a depth of about 2½ in. the spinal canal is entered, and spinal fluid begins to drop from the needle. Some operators allow 15 to 20 drops to escape before the analgesic solution is injected. The syringe, previously charged with 15 minims of stovaine solution (5 centigrams of stovaine), is applied to the needle, 6 or 7 drops of the spinal fluid is drawn into the syringe, causing an opacity to the stovaine solution, and then the whole contents are slowly injected into the spinal canal. Immediately the patient is placed on his back. I have found that a few drops of a ½ per cent. solution of cocaine injected under the skin at the site of puncture is valuable in nervous patients. Before beginning the use of cocaine a strong, healthy native soldier could not endure the pain of the puncture of the needle, and the operation had to be postponed.

(4) *Dosage.*—Three-fourths of a grain (5 centigrams) of stovaine for an adult. I have had good anæsthesia with 3 centigrams. As a rule, 7½ centigrams should not be exceeded. A friend to whom I had recommended the method did several operations, but always had retention of urine for some days after. Upon inquiry I found that he had been using ampoules containing 10 centigrams of stovaine instead of 5 centigrams, which explained the accidents.

(5) *Solution employed.*—The most convenient method is to use ampoules. These are always sterile and ready for immediate use, and retain their strength well. I am now using ampoules nearly two years old. The most convenient ampoules to have are those containing 5 centigrams of stovaine dissolved in 1 c.c. of water slightly saline. Barker's glucose solution is theoretically better than the watery solutions, but I have had no experience of it. Any solution in ampoules can be obtained through Jos. Flach, 16, Water Lane, London, E.C., who is the London agent for Poulenc Frères, Paris. My ampoules have been obtained through Charles Delacre and Co., Brussels. These I have found reliable, and cost 2s. per box of ten ampoules. A still more economical method is to buy pure stovaine in small crystals. Bottles of 5 grm., enough for 100 operations, can be bought for eighteenpence. I have found the solutions made by myself after the formula of Kroenig to be equally as good as the ampoules prepared by chemists.

Kroenig's formula is:—

Stovaine	0·04 grm.
Chloride of sodium	0·0011 grm,
Distilled water[1] to make 1 c.c.	

(6) *Duration of Anæsthesia.*—Usually from three to five minutes after the injection the anæsthesia is complete and continues for about one hour. A longer period may be obtained by lowering the head for a short time.

This method of anæsthesia must appeal to the medical man who finds himself single-handed, which is often the case in Colonial practice. How many men will recall operations made, with a layman trying to give chloroform, when it has been necessary to leave the operation to resuscitate the patient? With lumbar analgesia I have never had occasion to worry about the anæsthetic, and I have never had the least accident. I cannot too strongly recommend the method which has made possible much surgical work which I could not otherwise have undertaken.

AN ATTEMPT TO COLONIZE "MILLIONS" IN THE MALAY PENINSULA, FOR ANTI-MALARIAL PURPOSES.

By C. Strickland, M.A., B.C.Cantab.
Travelling Medical Entomologist, Federated Malay States.
(From the Malaria Bureau, Kuala Lumpur.)

Early in 1912 the Government of the Federated Malay States decided to attempt to colonize the well-known fish "millions" with a view to seeing if it could be turned to any account in the antimalarial campaign, and a consignment of these little creatures was therefore imported from the West Indies through the Imperial Bureau of Agriculture.

[1] Or rain-water collected in the open.

It is scarcely necessary to say that the Malay States abounds with little fish both of the cyprinodont and other families, some larvivorous, some not. Dr. Hanitsch, of the Raffles Museum, Singapore, has reported to Government, Straits Settlements, on the Singapore species, while there are many others captured in the Native States by the present writer, which remain to be identified. Nevertheless, the local species never seemed to be obtainable in swarms, as "millions" apparently are, and as, moreover, the crucial fact remained that in spite of them malaria was rampant, it was decided to give the "millions" a trial.

The little fish stood their long voyage of 13,000 miles very well. They did not seem to mind rusty tins or water which smelt of the egg on which they were fed. Their water was changed, however, *en route*, twice a week, and the only conditions which seemed to be bad for them were too much sun and the cold weather experienced in the channel.

Now it might in a way be satisfactory to even succeed in keeping such things as "millions" alive and well and multiplying in a closed vessel or tank, like one would gold-fish, but it would not be very useful in an antimalarial campaign. For this one must plant the fish out in what one may call the natural waters of the country, and indeed the Imperial Board of Agriculture only recommend, in a leaflet sent with the fish, that they be kept under observation and fed up for a few days after their voyage.

However, this planting-out is a very different thing, for they are then fully exposed to the attacks of their natural enemies, and the chances are against their finding conditions so satisfactory as the rabbit did on importation to Australia.

Our experience on trying was as follows:—

The main division of the consignment which we planted out in a small shallow lakelet, seemed to dwindle rapidly, apparently owing to the efforts of a mudfish called by the Malay *Ikan aruang*. Other small portions put in other places also disappeared, although in one large swamp it was not expected that they would be seen again until they would have multiplied enormously.

It was therefore decided to save the remainder, and nurse them up in a tank where they might be free from the attacks of enemies, until they had multiplied so exceedingly that the race, in a further attempt to colonize it in the natural waters of the country, might be able to survive attack by sheer weight of numbers.

Only 80 out of the original 800 were saved, and they have been placed in garden tanks, or concrete tanks specially made for them, and are now nearly sufficient to use in further experiments of colonization.

Our experience, therefore, suggests that it is advisable in attempting to colonize "millions" to nurse up a great quantity of them before planting out. Of course under certain conditions in other countries, a few fish placed in any place might survive and multiply, but it would seem that it might be always a matter of doubt, and it must be remembered that man himself is a natural enemy of fish.

Nevertheless although we originally placed a *few only* of the fish in a small reservoir dammed up on the hillside of a rubber estate, and although they were among those which disappeared, yet they have lately reappeared in an obviously increasing shoal. Those placed in the extensive swamp, mentioned above, have also reappeared. It is, therefore, satisfactory that partial colonization of "millions" has taken place in the Malay States, and it is hoped that by the use of large numbers complete colonization will be effected.

Whether malaria incidence will be affected is another thing, but as "millions" certainly eat mosquito larvæ, we may be sure that there will be less mosquitoes and therefore probably less malaria.

It seems almost superfluous to make any further note on the larvivorous properties of these fish, but a striking example was presented to us the other day in this respect.

Three large tanks near a house which had been deserted for some time were found to contain thousands of larvæ and pupæ, so five "millions" were placed in each. It was very interesting to see the fish going for the larvæ and stuffing themselves full until they could not touch another one. The lion then lay down with the lamb awhile, but at the end of ten days there were no more lambs left.

"Millions" can therefore at least be used for stocking tanks and other receptacles with, in order to reduce the Stegomyia and Culex, which abound in such great numbers in this country; and in addition there is reasonable hope that they will establish themselves in malariogenous waters, and effect a reduction of illness.

IRON IN ANCIENT INDIA.

Mr. Panchaman Neogi, Professor of Chemistry at the Rajshahi College, finds evidence of the manufacture of iron in India as far back at least as 2000 B.C., and from a passage in the "Black Yajurveda" it seems that some form of iron cannon had been used in the Vedic age between 2000 and 1000 B.C. The most remarkable instance of its employment appears in a medical work describing nearly 100 surgical instruments used for most delicate operations, a piece of evidence which seems to show that the manufacture of steel must have been well understood. The iron pillar near the Kutub Minar, Delhi, is of course well known, while the relics at Puri and elsewhere are also celebrated. The date of some is ascribed to A.D. 640, and that of the rectangular iron beams at Puri to A.D. 1174. The sixteenth century saw the first manufacture of cannons in India, when some of a remarkable size were turned out. The reader will find it difficult, after perusal of Mr. Neogi's pamphlet, to understand how it has come to pass that metallurgical experience and knowledge should have disappeared to such an extent from the country as it now appears to have done. The gap of the dark ages in Europe between ancient and modern knowledge seems to have had its counterpart in India.

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 15, 1915.

THE DESIRE TO BE AT THE FRONT.

THE desire "to get to the front" seems inborn in most people. Whether soldier, doctor, nurse, or chauffeur, the aim in war time is to get to the actual fighting line, or failing that, as near the line as possible. The question of danger is no deterrent; the more danger the more eager are volunteers to go. The forlorn hope never lacks recruits, nor does the command that the post is to be held at all costs check men's ardour. In fact, it would seem to be that the seat of danger has an attraction so overwhelmingly enticing that no considerations of danger lessen, but rather stimulate, the craving to be where wounds or death are well-nigh certain. To go back to the origin of things, we see that in the case of the child the command not to do a certain thing seems but a stimulus to fulfil that particular object of its desire. Certain punishment to follow seldom acts as a barrier to accomplishment; it is a long process of experience and education that alone stops the instinct to do what is uppermost in the mind. A "burnt child dreads the fire" is an example of experience which is curative in one particular direction at any rate, the degree of the punishment for transgressing in this instance being so severe that the disobedient act is not repeated.

Taking another example, the recorded disobedience of our first parents. The keen desire to taste of the tree of knowledge proved a temptation so strong for them that in spite of the dire punishment threatened they could not resist satisfying the craving within them. It would seem that this desire to be in the danger zone, in the place where death or punishment is the almost inevitable result of the act, seldom serves to hold people back, but rather urges them on.

Nor is it seen only where shells or bullets constitute the danger. When doctors are called upon to volunteer for work in a cholera camp there is never any lack of men willing to go: where typhus prevails, where yellow fever is rife, or any one of the many epidemic ailments which demand a high toll of life, there men will readily throng, exposing themselves to dangers which are as imminent as at the front of the fighting line.

The attraction would therefore seem to be universal for danger of all kinds, whether for the soldier, the child, the doctor, or nurse; yet the attraction arises, although from different origins or standpoints. In the case of the soldier in the fighting line, there can be no doubt that the attraction is deeper than the mere fighting instinct or than patriotism. It is something more than even these; it would seem to be a deep-rooted desire to be present at the shaping of things. The result of a war will be some alteration in the world's history, small or large, and to play a part in this is—quite unconsciously, no doubt, on the part of the individual soldier—the psychological factor that determines the primary instinct. Others may argue differently and say the desire to go to fight a foe with an army is born of the instinct for a man to defend his wife and family. In earlier days the man armed himself and went outside his cave or dwelling to keep off an encroaching foe, whether man or beast, and the assemblage into armies is a mere repetition of the primitive plan. But from individual defence to national defence the sequence is not reached so simply or directly as would appear at first sight. A man who quarrels with another naturally fights, but between that and voluntarily serving in an army, which is part of the political machine of his country, is an evolution much more complex. Countries on the Continent of Europe, instead of waiting for evolution to bring forth an army, proclaim service compulsory.

It is certain that these armies would be but a tithe of their present dimensions were voluntary

service allowed, and it was this knowledge that induced governments to think for the people and establish compulsory service. In this country, although the man is ever ready to individually fend for or to defend his family, he does not see it to be his duty to train himself in arms to defend his country. The Volunteer Army in Britain in peace time was a mere fraction of the community, and the members of it have had to bear the brunt of ridicule on the part of their neighbours, slighting on the part of the military authorities and of the regular military class. It was only when the enemy came threatening their belongings and their means of livelihood that the men came forward in anything like large numbers. The desire to get to the Front develops, but the slow process of training is resented with an intensity which amounts often to regret that they ever offered themselves for service. To serve his country and not get "to the Front" makes a sorry and disappointed soldier, and he would escape from the position if he could. The Front, however, when he gets there, presents but little attraction as a rule, when trench life is experienced and the rigours of winter are added. Yet would he rather be there than stationed at the base, where routine is the order of the day, and where fighting and danger may be unknown.

The writer is acquainted with an episode which illustrates this desire in the matter of getting to the scene of activity in the matter of a cholera epidemic. In 1883 twelve doctors left England for Egypt to treat cholera, which was then rife in that country. They landed at Alexandria, where it was found that in that city no cholera existed, but that in Cairo people were dying at the rate of 1,000 daily. Two of the twelve were ordered to remain in Alexandria and the other ten were to proceed to Cairo. No one volunteered to stay in Alexandria, although there was no danger and comfortable surroundings were ensured; at last lots had to be drawn, and the two who drew the lots which compelled them to remain in Alexandria were in the depths of despair at being left behind; as one man expressed it: "I would rather have lost my left hand than have stayed behind." This example affords yet another phase of mental attitude in the "to get to the front" desire. At this "front" the hopeless task of fighting a disease did not seem stimulating, and the chances of contracting the ailment, seeing that one is exposed to the conditions which generated the disease amongst the residents in the country, would surely at first sight act as a deterrent to any inducement to go there. It may be ascribed to enthusiasm for one's profession that urges the doctor to go forward, but, taking the example of the doctors at the seat of war at present, this cannot be wholly the reason. The doctors at the base hospitals feel aggrieved that they cannot get further forward, so as to be near or actually at the fighting-line, in the very trench. A medical officer, who has been seven months with his corps at the Front and under shell and rifle fire, on being promoted, resented much having to go back to a hospital at the base, and wished promotion had been deferred rather than that he should leave the Front. At the hospital his professional work would have been multiplied a hundredfold, for at the Front it was possible only to render "first aid to the injured." Professional enthusiasm was not the cause of his wishing to be left at the Front; and when one comes to analyse the trend of thought it would seem that the desire to be where history was actually being made was the unconscious cause of his desire to be at the danger, and for the most part unprofessional, zone.

There is no doubt at the actual fighting-line warfare is seen at its best. The wounded are speedily removed and only sound men are left. To clear the front is the primary duty of the medical staff at the Front, and after twenty-four or forty-eight hours all traces of an action are obliterated. Not so along the lines of communication or at the base: at these points there are none but sick or wounded men to be seen and dealt with; the joy of battle is not there, nothing but the suffering war entails. Here the professional opportunities for the doctors are plentiful; yet, as we have seen above, will even the ardent professional enthusiast leave these great opportunities behind in order to get to the fighting-line. Account for it how one may, this desire is instinctive and not to be explained, except on the basis that there history is made and that one is taking a direct part in the world's destinies.

GENERAL NOTES.

Afghanistan, usually regarded as a barren, mountainous district, possesses, like all mountainous areas, fertile valleys. There are two harvests, one in summer, when wheat, barley, peas and beans are reaped, the other in autumn, when many grains are gathered, including rice, Indian corn, millet, arzun, and jowari. In addition to these cereals are crops of clover, lucerne, hemp, &c., whilst amongst medicinal plants we find rhubarb, opium, turmeric, madder, ginger. Fresh and dried fruits find their way to India in quantities. Fruits met with in both temperate and sub-tropical climates are plentiful in Afghanistan and form the staple diet of the Afghans during a part of the year.

Cutch.—An extract from the bark of certain species of mangroves in Malaya possessing valuable tanning qualities. Owing to the serious shortage of tanning extracts in British tanneries cutch is likely to be much sought after in the future. Meantime the bark is thrown aside as waste.

NOTES ON TREATMENT.

Intestinal Flatulence.—Kerol, 3 minims, in kerolin capsules, given in from one half hour to one hour after meals, twice or thrice daily, is highly spoken of as an intestinal disinfectant. Kerol is an oxygenative compound with a di-phenyl nucleus, instead of the mono-phenyl nucleus of carbolic acid; it is less toxic than carbolic acid, but possesses a higher germicidal value.

Annotations.

Unusual Complications of Typhoid in Two Children.—A. Melchiorri (*Gazetta degli Ospedali e delle Cliniche*, Milan, August 13, xxxv, No. 97, pp. 1017-1024) describes two cases in which pains and œdema in the scrotum were accompanied by bilateral radial paralysis in one case and total aphasia, complete by the fourth day. In both there was pronounced hypotonus at first, soon yielding to hypertonus. One of the children became extraordinarily emaciated and developed bed sores. Both recovered, but they were in the hospital three and four months.

Treatment of Psoriasis.—F. Wise (*Therapeutic Gazette*, September, 1914) first removes the scales with:—

Pasta Lassar	... ...	ʒi
Ol. olivæ ...	... ...	ʒi
Acid salicylic	... ...	5 per cent.

Excess of inflammation is soothed by calamine lotion. When scales have been removed a stimulating ointment is used:—

Ol. rusci ...	... ...	10
Acid salicylic		
Chrysarobin	... ...	āā 20
Adeps lanæ hyd.		
Sap. moll. ...	... ...	āā 25

Here chrysarobin is the main ingredient, used in 5 to 20 per cent. strength, in accordance with the effect of the sample. If itching occurs 3 gr. of menthol to the ounce is added. If excess of inflammation results, calamine lotion, with 1 gr. of menthol and 15 gr. of phenol to the ounce is continuously applied as:—

Phenol	... ...	ʒi
Menthol	... ...	gr. iv
Calamine	... ...	ʒii
Zinc oxide	... ...	ʒiii
Glycerine	... ...	ʒi
Liq. calcis	... ...	℥i
Aq. rosæ	... ... ad.	℥iv

[The original *Lassar's Paste* consisted of starch, zinc oxide, wool fat, and soft paraffin; but recently salicylic acid has been added, and the paste now consists of: Starch 24, zinc oxide 24, salicylic acid 2, vaseline 50.—ED.]

[Oleum rusci pyroligneum is said to be derived from butcher's broom; it is really identical with oleum betulæ pyroligneum (birch tar). Both these oils are used instead of tar.—ED. (*See* Martindales, 1915).]

The Hæmatozoa of Birds. The Sporogony of Hæmoproteus columbæ.—The record of an excellent piece of research work, carried out by Helen Adie at the Kasauli Laboratory, India, is given in the *Indian Journal of Medical Research*, January 1, 1915. The subject was to find out what part the fly Lynchia plays in carrying on the infection of pigeons by the *Hæmoproteus columbæ*. Previously Sergent Brothers had proved by experimental evidence that a Lynchia was the transmitter in Algerian pigeons, but neither they nor Aragao could trace the parasite beyond the oökinete stage in the fly's gut. Mrs. Adie worked with pigeons from Ambala, about eighty miles south of the Himalayas, as infected pigeons did not exist at Kasauli, and the fly was shown to be the *Lynchia maura*, Bigot, the common pigeon parasite. After a patient investigation extending from June to September, 1914, not only were the oökinetes found, but a succession of events, including the oökinete, the zygote, the bursting oöcyst setting free sporozoites and vast numbers of sporozoites in the salivary glands and duct. The article is accompanied by excellent drawings of careful dissection of the alimentary canal of *H. columbæ* and of the salivary glands full of sporozoites.

The conclusions gathered from this research are: (1 and 2) Pigeons heavily infected with Hæmoproteus have associated with them infected Lynchia flies.

(3) The development of Hæmoproteus can be traced through the oökinete, zygote, and oöcyst stages in the Lynchia flies; and sporozoites are to be seen in vast numbers in the salivary glands and ducts.

(4) Both sexes are blood-sucking flies and carry the infection. Laboratory-bred flies placed on infected birds have shown both zygotes and sporozoites of the same type as those of naturally infected flies.

(5) At Kasauli, where the native pigeons are not infected by *H. columbæ*, they became infected when bitten by infected flies brought from Ambala (an infected district).

(6) The sporogony of *Hæmoproteus* in this Lynchia is similar to that of *Proteosoma* and the malaria parasite.

An interesting addendum to this paper is an observation, also by Mrs. Adie, that on the legs of the Lynchia flies a mallophagus was not infrequently found attached, and that dissection showed its gut to be full of pigeon's blood. It would thus appear that the mallophagus is nourished by the pigeon's blood taken from the Lynchia.

THE FRIEDMANN TREATMENT FOR TUBERCULOSIS.

AFTER a careful investigation of this treatment by the United States Public Health Service, the conclusions as to its efficacy are not favourable. Friedmann's claim to have originated a specific cure for tuberculosis is not substantiated, and that the inoculation of persons and animals with his organism is without harmful possibilities is disproved.

Abstracts.

THE TREATMENT OF ANKYLOSTOMIASIS.[1]

By Dr. OZZARD.

DR. OZZARD, in a paper read before the British Guiana Branch of the British Medical Association, stated that the only successful treatment of ankylostomiasis at the present day lies in the direction of prevention.

Thymol leaves much to be desired in many ways. I have yet to meet with the case of ankylostome infection where one course of the so-called intensive treatment will effect a cure.

The administration of quinine will not of itself eradicate malaria from a country. Mosquito extermination has to go hand in hand with quinine administration if a really effectual campaign is to be carried out.

Similarly with ankylostomiasis, thymol is never going to rid a community of the disease. You must at the same time carry on a rigorous sanitary campaign if you really desire to exterminate the disease.

Ankylostomiasis is not a race disease, but a dirt disease simply and solely. If clean-living people in a country swarming with the infection can, merely by keeping clean, insure themselves against ankylostome infection, surely this is the evident direction in which to move to prevent the spread of the disease.

Of various methods of treatment tried during the last two or three months one is that of Dr. Barnes. His formula is mag. sulph. 1 dr.; inf. quass. 5 oz. This dose is given early in the morning after the usual preliminary fasting and preparation of the patient. It is given for a week or longer. This has not proved satisfactory.

Soon after this a patient came with amœbic dysentery in which numerous ankylostome ova were present. Emetine was adopted, and the ova gradually disappeared from his stools, although no special treatment for ankylostomes had been adopted. His stools remained free of ova on his discharge from hospital.

In 7 out of 13 cases of ankylostome infection Dr. Ozzard found that there were no ova in their stools on their discharge from hospital after treatment by emetine. The results are at least sufficient to stimulate one to make further trials.

Oil of chenopodium is quite as good as, if not better than thymol. There are many advantages possessed by this drug compared with thymol. It is not nearly so nauseous; there are no disagreeable after-effects; it has no toxic properties when given in therapeutic doses. The method of administration is as follows: The patient is starved for eight hours, at the end of which period he is given 1 oz. of Epsom salts. Two hours later 16 drops of the oil is given, and repeated at two-hourly intervals until three doses have been given. Some physicians then give, two hours after the last dose, 1 oz. of castor oil with 50 minims of chloroform. We have not done this in our cases.

Four out of seven cases so treated have left hospital without showing ova at the last examination of their stools.

Phillip's mixture seems to give no better success than the other drugs mentioned.

Oil of male fern has been found useless by the Porto Rico Commissioners even in toxic doses.

I may as well add that I commenced these investigations prejudiced in favour of the treatment by thymol, as up to this time I had always found this the most reliable drug. But I never felt sure that I had been able to rid my patients of all their ankylostomes by this means. I think it is in the experience of most of us that a large number of patients drugged with thymol, at times to a dangerous extent, yet leave hospital showing numbers of ankylostome ova in their stools. In my present series of cases, one patient got a daily dose of 40 gr. for eight days, but was still passing ova at the end of this period; another patient received 40 gr. a day for twelve days and continued to show ova in the stools at the end of this period; and yet another with a similar course gave the same results.

Beta-naphthol has not proved so efficacious as thymol.

A treatment is in use in Venezuela by means of a latex of a tree belonging to the *Ficus* family. The Venezuelans speak very enthusiastically of this method of treatment.

PREVENTIVE MEASURES.

I have only referred casually to the preventive measures which should be adopted. Two words, however, are all that are really required to sum up the preventive measures to be adopted—"Be clean."

Obviously the great point is to keep people free from fæcal contamination. Clean hands and clean feet are all that is necessary. No doubt a little difficult with the class of people we have to deal with, but by no means impossible of carrying out.

Fæcal contamination of the soil and water must be prevented. The deposits of fæces must be limited to as small a space as possible, and that particular spot must be recognized as dangerous to walk on, and its approaches should only be reached by well-shod feet.

The question as to which kind of latrine is the best for our villages and estates is, of course, not so easy to decide. For villages, I think the movable model as designed by our Public Health Department is quite good.

The Porto Rico Commissioners state that all that is necessary is a hole in the ground surrounded by a thatch or back lean-to. When nearly full it can be covered with earth and another dug. When working in the field the labourer is scarcely ever without his hoe, which could be used for covering the excreta voided there of necessity.

[1] Abstracted from a paper read before the British Guiana Branch of the British Medical Association on November 18, 1914.

Better, however, than leaving any ground to become infected will it be to make this impossible. In other words, the fæces should be got rid of without coming into contact with the ground. This may be done by having your latrines over an open trench through which there is always a good flow of water, eventually opening into the sea or other large body of water. Some of our villages have such trenches, and this plan is quite capable of adoption in them. The fæces falling into the water effectually hinders the development of the larvæ, and but few people would care to wallow for any length of time in such trenches. Even in trenches with but a poor flow of water little harm can result, as people will not as a rule walk through such trenches. Perhaps the most satisfactory method of all is by the storage of the fæcal matter in large cemented watertight pits on the Chinese plan. The septic tank system evolved by Drs. Wise and Minett somewhat resembles this method, and is very efficient for houses and institutions under proper control.

Simple in construction and cheap though their plan is, it is yet too complicated for our village folk, and is entirely dependent on a continuous supply of water.

These various methods deal with the disposal of fæces, and if rigidly carried out there can be no need for any further precautions. People, in addition, must be taught and shown the necessity of eating and drinking with clean hands, and they must be taught to avoid walking on dangerous ground unless properly shod. In the canefields there are always large trenches full of fairly good water where labourers could wash their hands. If necessary, it would not be a very expensive method to erect a few troughs where labourers could perform their ablutions. Nor would it be a very difficult matter to persuade the labourers to wear boots or shoes, or to induce them to walk through buckets of Barbados tar and sand.

The Porto Rico Commission describe all attempts at chemical disinfection as useless and impracticable.

With regard to ankylostomiasis and ankylostome infection in an insanitary country such as British Guiana, we may look upon the infected individuals with perfect equanimity so long as we adopt a simple and quite inexpensive method of latrine accommodation—the only requirement of the latter being to prevent soil contamination. Provide this and you will never need costly Commissions and tons of nauseous drugs. Keep the drugs for those who show the terrible symptoms of the disease.

TREATMENT OF DIABETES MELLITUS WITH CASEIN AND CREAM.[1]

By R. T. Williamson, M.D.Lond.

Casein and cream are given in small quantities every two hours. The patient is kept at rest in bed, or on the sofa, and every two hours, from 8 a.m. to 10 p.m., receives a glass of artificial milk prepared from casein, cream, and water. One tablespoonful of casein is well mixed in a tumbler with one tablespoonful of cream until a paste is formed; then hot water (or cold if preferred) is added gradually until the tumbler is full, the mixture being well stirred with a teaspoon whilst the water is being added. A white fluid is thus prepared which has the appearance of milk. It contains milk albumen and fat, but only a very small percentage of milk sugar derived from the cream. The fluid may be sweetened with saccharine or saxin if desired, or a pinch of salt may be added, or it may be flavoured with nutmeg, according to the patient's taste. Most patients prefer the fluid warm. Usually the patient takes this artificial milk quite well, and likes the taste; some take it well, but do not find the taste quite satisfactory; but a few patients complain that it causes nausea, and in such cases it should be at once discontinued. The fluid may be taken well when it is hot, but may cause nausea when lukewarm or cold. When it produces nausea, or is distasteful even when the fluid is warm, another preparation of casein should be tried; or, in place of casein, biogene should be employed, but double quantity of the latter should be used—that is, *two* tablespoonfuls of biogene with two of cream to the tumblerful of water. Usually a cheap casein preparation, sold at 1s. per lb., was used, but a more expensive casein, dietetic casein (A), is more palatable to some patients. Recently biogene (which is a casein preparation) was chiefly employed, though it is more expensive (3s. per lb.). It may be obtained from Mr. Bonthron, 50, Glasshouse Street, London, W. Most patients like the taste of biogene much better than casein.

The diet of casein and cream, as just described, is sufficient to satisfy some patients at least for several days; but many, of course, feel very hungry, and in a few cases the casein treatment causes the patient to feel very exhausted.

When the patient feels very weak or exhausted on the casein treatment alone, he may be allowed, in addition to the casein and cream, a cup of tea and beef-tea twice a day; if he still feels very weak on this diet, two eggs (buttered) may be allowed daily, and after a few days one casein pudding may be added. The casein pudding is prepared as follows:—

One tablespoonful of casein.
One egg well beaten up.
A small pinch of salt.
One teaspoonful of baking powder.

Mix well together, adding the baking powder just at the last. Then bake in the oven like a custard for thirty minutes. The addition of a little water may be necessary if the egg is a small one. This forms a cheap and palatable pudding.

Usually the treatment with the casein and cream causes a little loss of weight; but for a week or two if the patient rests in bed or on the sofa all day, the loss is only a few pounds, and it is desirable to keep the diet down to the minimum amount; but it is important not to allow the patient to become exhausted by the treatment.

[1] Abstracted from the *British Medical Journal*, March 13, 1915.

In milder cases of diabetes and in many cases of medium severity the urine becomes quite free from sugar in two or three days or in a few days, even when an ordinary very rigid diabetic diet has failed to check the glycosuria. In many cases the casein treatment can be continued for two or three weeks, or a little longer, without much loss of weight and without producing much weakness or unpleasant symptoms; and the urine may be kept free from sugar during this period. The patient's condition, however, should be carefully watched, and if he should become weak or exhausted at the end of the first week (or earlier) additions to the diet should be made at once. If he tolerates the casein treatment it may be continued for two weeks or a little longer. But then, if not earlier, additions to the diet should be made. A buttered egg or casein pudding may be allowed once a dry, then a little suitable diabetic bread (3 oz. daily) may be allowed (casein bread, or coco-nut and biogene cakes, or casoid, or akoll biscuits), or two buttered eggs may be allowed daily. If these additions to the diet cause the sugar to return in the urine, they should be cut off and the diet restricted to the casein and cream. Whilst these additions to the diet are being made the amount of casein and cream should be gradually diminished to three or four glasses daily.

The following is another diet which is often useful if the patient feels very weak; or if the biogene and cream be unpalatable, or if he should be losing weight considerably:—

8 a.m.—Cream, 1 oz., and tea; one buttered egg.

10 a.m.—Cream, 1 oz., with beef-tea, 10 oz.

12.—Biogene and cream and water (or egg and cream).

2 p.m.—Custard.

4 p.m.—Cream, 1 oz., and beef-tea, 10 oz.

6 p.m.—One egg, boiled or buttered; cream, 1 oz., and tea.

8 p.m.—Biogene and cream (or egg and cream or beef-tea).

10 p.m.—Cream, 1 oz., and beef-tea, 10 oz.

If the additions to the diet are not followed by a return of the glycosuria further additions may be made. The following is a diet often allowed at this period:—

Breakfast.

Coffee (or tea) with cream, or casein and cream.

Eggs buttered (poached or boiled), or tomatoes, or mushrooms.

Biogene and gluten cakes, gluten and coco-nut cakes, coco-nut and biogene cakes; casoid or akoll biscuits, or suitable diabetic bread; butter.

Dinner.

Bacon cooked in any way, or fat of meat (cold), or fish; cabbage, cauliflower, Brussels sprouts, turnips, French beans, spinach, broccoli, boiled walnuts, asparagus, vegetable marrow, tomatoes, mushrooms, salad, lettuce, cucumber, watercress, celery, radishes.

Casein pudding, or coco-nut pudding (free from sugar), or custard.

Suitable diabetic biscuits or bread.

Water, claret, hock, Salutaris water.

Tea or Evening Meal.

Tea and cream, or casein and cream.

Eggs (buttered, poached, or boiled), Welsh rabbit, cheese.

Salad, lettuce, cucumber, radishes, mushrooms, tomatoes, boiled egg and spinach, watercress.

Biogene and gluten cakes, gluten and coco-nut cakes, coco-nut and biogene cakes; casoid or akoll biscuits, suitable diabetic bread; butter.

If this diet is not followed by glycosuria then the patient is allowed an ordinary rigid diabetic diet—meat, fish, or fowl, being given in place of bacon at dinner, and bacon being allowed for breakfast. Much later a small amount of white bread may be added (at first only 3 oz. daily).

By the casein treatment followed by other additions to the diet gradually made, as just indicated, the urine may often be kept free from sugar for three, four, or six weeks, and after the return to the ordinary diabetic diet it may remain free from sugar for months, though previous to the casein treatment, when the patient was taking an ordinary rigid diabetic diet, sugar was excreted in the urine in considerable or large quantities. Thus in one case the urine was still free from sugar eight months, in another six months, after the casein treatment (and both were young patients).

In the majority of cases, however, in course of time, sometimes rapidly, sometimes slowly, the sugar reappears in the urine after the patient has returned to a less rigid diet. But the benefit of the treatment is shown by the fact that the sugar excretion on such a diet is much less than that when the same diet was taken before the casein treatment. A return to the casein treatment may be then desirable for a short time; and such periods of casein treatment may be recommended once a month or less frequently.

The casein treatment must not be regarded as a cure for diabetes in the strict sense, but as a powerful method of temporarily removing the sugar from the urine in many cases, and of improving the power of sugar destruction, so that the sugar excretion may be afterwards more easily controlled by ordinary more or less rigid diabetic diets or restricted diets.

In the most severe forms of diabetes with marked diacetic reaction in the urine, experience so far has been that in many such cases it is of little value, and it may be very unsuitable in certain cases. In other cases, however, very satisfactory results were obtained, and both diacetic acid and sugar have disappeared from the urine for a time under the casein treatment.

When the casein treatment is used in severe forms of diabetes with marked diacetic acid reaction in the urine, a small amount of oatmeal porridge and cream twice a day and biogene and cream four

or five times daily, is given, first, for two days, and then the porridge is discontinued and followed on with the biogene and cream alone, as described. In some cases I have given oatmeal porridge three times a day for two days and then followed with the biogene and cream, with excellent results. But much caution is desirable, and such treatment may not be advisable in certain cases.

The treatment with casein is a prompt method of removing the sugar from the urine in many cases of diabetes of the milder form, and in many cases of medium severity. The ordinary rigid diabetic diet should be tried first, and if this succeeds the casein treatment is not necessary; but in the numerous cases in which the ordinary rigid diabetic diet fails to remove the sugar from the urine the casein treatment often succeeds, and for some time—weeks or months—the urine remains free from sugar, and this is the value of the treatment. In some cases, of course, the treatment fails.

Advantages of the Casein Treatment.

(1) This method will often remove the sugar from the urine when the ordinary rigid diabetic diet has been unsuccessful, and this is its great value.

(2) The results are often prompt, the urine being free from sugar after two or three days.

(3) After a period of treatment with casein and cream the patient is often able to take ordinary diabetic diet, or even a less rigid diet, without the appearance of sugar in the urine, whilst previous to the casein treatment the most rigid diabetic diet did not remove the sugar from the urine.

(4) Though the sugar will return in the urine in course of time in most cases after the patient's diet has been relaxed, still the return is much less rapid than when the sugar has been removed from the urine by an ordinary rigid diabetic diet.

(5) The casein method is not expensive and is easily carried out.

(6) In most cases of the very severe forms of diabetes in which the urine contains much diacetic acid the casein treatment is of little value, and sometimes may be very unsuitable; still in certain cases it is of much service, and may remove the diacetic acid and even the sugar from the urine for a short time, and on returning to a less rigid diet the sugar excretion may be very small for a long time and the diacetic acid may not return for a long period. Of course, such cases form only a minority of the cases of this class.

Unfavourable Results and Dangers.

The treatment requires to be very carefully watched and the patient seen daily and the urine tested daily during the casein treatment. It is necessary to discontinue the treatment promptly in a small percentage of the cases, owing to the onset of the symptoms which I shall now mention.

A feeling of great weakness and exhaustion occurs in a few, and it is then desirable to discontinue the treatment on this account. Others become mentally depressed and irritable at what they consider a harsh treatment, and will not continue it. In a few it produces dyspepsia, or diarrhœa, or constipation; but in the majority of cases it can be followed quite easily and without unfavourable symptoms. When it cannot be taken the diet of cream, eggs, custard, beef-tea, already described, may be recommended.

Patients who are fond of the pleasures of the table and like nice foods will probably regard the casein treatment as monotonous, or as one of my patients expressed it, "not interesting." But many take it readily and without any dislike, and are delighted at the results as regards the sugar excretion.

In the casein treatment just described:—

(1) The amount of carbohydrates in the food is reduced to the minimum.

(2) The total quantity of food is reduced to a very small amount.

(3) The food is given in small quantities at frequent intervals—every two hours.

LONDON SCHOOL OF TROPICAL MEDICINE.

Examination Results. Forty-seventh Session. January—April, 1915.

W. J. J. Arnold, M.B., B.Ch. (Colonial Service); E. Banos, M.D.(Colombia); R. Bruce-Low, M.R.C.S., L.R.C.P. (Colonial Service); G. Campbell,[1] M.B., Ch.B.Glas., distinction; P. T. Patel, M.R.C.S., L.R.C.P., M.B., B.S.Lond., L.M.S. Bombay; W. L. Peacock, M.B., Ch.B.Glas. (Colonial Service).

Review.

The Diagnostics and Treatment of Tropical Diseases. By E. R. Stitt, A.B., Ph.G., M.D., Medical Director U.S. Navy, &c. With eighty-six illustrations. Pages xi + 421. Post 8vo. 1914. H. K. Lewis, 136, Gower Street, London, W.C. Price 8s. net.

This book is written from the standpoint of the experienced teacher whose aim it is not only to give the essential facts, but to present them in such a cross-referenced manner that the student can visualize the subject from every angle.

A work of this size for many students is preferable to a larger text-book. It is also an advantage to practitioners, who can rapidly glance over it and inform themselves of the most recent investigations in tropical medicine. This applies not only to those resident in the Tropics, but also to the many others who are occasionally called upon to diagnose and treat tropical cases.

[1] Dr. Campbell has been awarded the "Duncan" Medal of the L.S.T.M., this being awarded to the student who obtains the highest aggregate of marks during the session.

Original Communications.

THE METEOROLOGY OF MALARIA.

By Mathew D. O'Connell, M.D.

Below I give the atmospheric conditions at Culebra, the central station of the Panama Canal, for a continuous period of forty-eight hours in the month of August, when malaria fever is prevalent in the Canal zone.

The velocity of the wind, the rate of movement of the air at the level of the anemometer, is given for every hour. The dry bulb temperature and drying power of the air are only given for every second hour. The atmospheric conditions which raised body temperature in the spinning and weaving sheds I have placed in line therewith for comparison.

Comparing the atmospheric conditions at Culebra with those which raised body temperature above normal in the spinning and weaving sheds, it is seen in the first place that the dry bulb temperature of the air at each hour of the whole period at Culebra was identical with that of an atmosphere

Panama Canal, Culebra, 1913	Hourly atmospheric conditions at Culebra, Panama Canal Central Station						Atmospheric conditions which raised body temperature in the spinning and weaving sheds in Lancashire and Ireland				Degree to which body temperature was raised by exposure in the spinning and weaving sheds		
	Temperature of air, F.		Relative humidity of air	Drying power of air per 10 c. ft.	Velocity of wind per hour		Temperature of air, F.		Drying power of air per 10 c. ft.	Movement of air per hour	Body temperature in mouth, F.	Pulse	Respiration
	Dry	Wet	Per cent.	Grains	Miles		Dry	Wet	Grains	Miles			
August 1, 1 o'c. a.m.	74·0°	73·4°	97	7·4	8		74 0°	70·0°	19 0		100·0°	98	22
,, 2 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 3 ,,	74·0	73·4	97	7·4	7		74·0	70·0	19·0		100·0	98	22
,, 4 ,,	..	..	..	..	9		..	..	..		..	..	..
,, 5 ,,	73·0	72·3	96	6·6	7	A	73·0	70·0	14·0		100·0	80	15
,, 6 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 7 ,,	81·0	78·4	87	19·6	7		81·0	77·0	22·0		100·4	120	24
,, 8 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 9 ,,	86·0	80·0	72	37·0	8		86·0	77·5	49·0		99·2	80	20
,, 10 ,,	..	..	..	..	9		..	..	..		..	..	..
,, 11 ,,	89·0	79·6	60	56·6	8		89·0	79·0	60·0		100 0	108	24
,, 12 o'c. noon	..	..	..	..	8		..	..	..		..	..	..
,, 1 o'c. p.m.	91·0	79·3	54	70·6	10		90·0	75·0	82·0		99·8	94	24
,, 2 ,,	..	..	..	..	10		..	..	..		..	..	..
,, 3 ,,	91·0	80·3	57	66·3	11	B	90·0	75·0	82·0		99·8	94	24
,, 4 ,,	..	..	..	..	14		..	..	..		..	..	..
,, 5 ,,	84·0	77·0	68	39·0	13		84 0	77·0	39·0	No movement of the air perceptible	100·3	81	26
,, 6 ,,	..	..	..	..	10		..	..	..		..	..	..
,, 7 ,,	79·0	74·6	78	23 0	9		79·0	73·5	28·0		100·3	110	24
,, 8 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 9 ,,	77·0	75·4	91	8·6	8		77·0	73·5	18·0		100·3	110	24
,, 10 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 11 ,,	76·0	75·1	95	4·1	9		76·0	72·0	20·0		99·4	88	20
,, 12 o'c. midnight	..	..	..	..	9		..	..	..		..	..	..
August 2, 1 o'c. a.m.	75·0	74·0	94	5·0	7		75·0	69·5	26·6		100·2	110	18
,, 2 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 3 ,,	75·0	74·5	97	3·3	6	A	75·0	69·5	26·6		100·2	110	18
,, 4 ,,	..	..	..	..	8		..	..	..		..	..	..
,, 5 ,,	75·0	74·1	95	4·1	8		75·0	69 5	26·6		100·2	110	18
,, 6 ,,	..	..	..	..	6		..	..	..		..	..	..
,, 7 ,,	78·0	76·6	92	8·0	7		78·0	73·5	23·0		100·0	100	30
,, 8 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 9 ,,	85·0	81·0	80	25·0	8		85·0	77·0	45·0		100·4	120	24
,, 10 ,,	..	..	..	..	10		..	..	..		..	..	..
,, 11 ,,	88·0	80·2	66	47·7	10		88 0	80·0	49·0		100·0	108	16
,, 12 o'c. noon	..	..	..	..	8		..	..	..		..	..	..
,, 1 o'c. p.m.	86 0	79·2	69	40·0	5	B	86·0	77·5	49·0		99·2	80	20
,, 2 ,,	..	..	..	..	7		..	..	..		..	..	..
,, 3 ,,	84·0	76·5	66	42·5	7		84·0	77·0	39·0		100·3	84	26
,, 4 ,,	..	..	..	..	10		..	..	..		..	..	..
,, 5 ,,	77·0	73 6	82	17·6	14		77·0	73·0	20·0		100·1	100	18
,, 6 ,,	..	..	..	..	6		..	..	..		..	..	..
,, 7 ,,	77·0	76·1	95	4·1	6		77·0	73·0	20·0		100·1	100	18
,, 8 ,,	..	..	..	..	7	A	..	..	..		..	..	..
,, 9 ,,	76·0	75·3	96	6·3	7		76·0	70·0	29·0		100·2	88	25
,, 10 ,,	..	..	..	..	5		..	..	..		..	..	..
,, 11 ,,	75·0	74·3	96	3·3	7		75·0	68·0	32·0		100·2	88	25
,, 12 o'c. midnight													

Atmospheric conditions bracketed A will cause fever.
,, ,, ,, B will not cause fever.

which raised body temperature above normal in the spinning and weaving sheds, except at 1 o'clock and 3 o'clock p.m. on August 1, when it was higher. This apparently indicates that the impediment to loss of heat from the body by radiation at Culebra was as great for the whole period of forty-eight hours as it was in the atmospheres which raised body temperature above normal in the spinning and weaving sheds.

In the next place it is seen that the drying power of the atmosphere at Culebra was considerably less for the whole period of forty-eight hours than the drying power of the atmosphere, which raised body temperature in the spinning and weaving sheds, except at 5 o'clock p.m. on August 1 and at 3 o'clock p.m. on August 2. This shows that the impediment to loss of heat from the body by evaporation was much greater at Culebra than in the atmospheres which raised body temperature above normal in the spinning and weaving sheds, except for one or two hours on each afternoon.

Taking together, then, the impediment to loss of heat from the body both by radiation and evaporation, it is clear that it was much greater at Culebra than it was in the spinning and weaving shed atmosphere, which raised body temperature to 37·7° C. (100° F.) or even higher.

When, however, we compare the rate of movement of the air in both atmospheres, it is seen that the velocity of the wind during the forty-eight hours at Culebra, as registered by the anemograph, varied from five to fourteen miles per hour; whilst it is stated in the Official Report that no movement of the air was perceptible in the spinning and weaving sheds.

This would seem to show that the impediment to loss of heat from the body by conduction and convection was much less at Culebra than in the spinning and weaving sheds, the effect of which would be to reduce any increase of body temperature due to the heat and dampness of the atmosphere there. Whether such reduction would be sufficient to neutralize the increase of body temperature due to the heat and dampness of the atmosphere I am unable to say.

The difference in the rate of movement of the air at Culebra and in the spinning and weaving sheds is not, however, as great as it would seem from the above statements, for in the first place the velocity of the wind as recorded by the anemograph at Culebra is that at the level of the instrument, which is usually placed on the most elevated and exposed position in an observatory. The rate most suitable for my purpose would be that of the air immediately surrounding the inhabitants individually, that is the rate of movement of the air not more than six feet above the surface of the ground in the less exposed places. In such places the rate of movement of the air would of course be much less than at the level of the anemometer.

In the next place, although it is stated in the Official Report that no movement of the air was perceptible in the spinning and weaving sheds, I think it is evident that there must have been some, even if slight, movement. For the sheds are ventilated, some by windows, and some by fan ventilators capable of changing the whole atmosphere of each shed from three to eighteen times per hour. The *direction* of the movement of air within the shed was also ascertained by means of smoke and finely constructed anemometers. Moreover, the operatives placed near the ventilators in the sheds complained of draughts, and even sometimes closed the ventilators to stop the draughts. So there must have been some movement of the air in the spinning and weaving sheds. Hence the difference between the rate of movement of the air in the less exposed places at Culebra not more than 6 ft. above the ground, and the rate of movement of the air in the spinning and weaving sheds must have been far less than the figures indicate.

From the anemograph records given it is seen that at Culebra, as indeed usually elsewhere, the velocity of the wind is less by night and greater by day. From 1 o'clock to 9 o'clock a.m. on August 1 it varied from 7 to 9 miles per hour, whilst from 9 o'clock a.m. to 9 o'clock p.m. it varied from 8 to 14 miles per hour. This, of course, indicates that the impediment to loss of heat from the body by conduction and convection was much greater, especially in the less exposed places, at Culebra during the night than it was during the day. Hence its effect would be to raise body temperature during the night and to reduce it during the day; in other words, to aggravate the effect of the heat and dampness during the night and to mitigate it during the following day. But, as I have tried to make clear above, the heat and dampness of the atmosphere at Culebra for the whole period of forty-eight hours were such as would raise body temperature to 37·7° C. (100° F.) or even higher. Hence the effect of the lower velocity of the wind, amounting in less exposed places to stagnancy, during the night would be to raise body temperature above 37·7° C. (100° F.), and the effect of the greater velocity of the wind during the day would be to reduce body temperature below 37·7° C. (100° F.).

In like manner during the remainder of the period of forty-eight hours at Culebra the atmospheric conditions at night were such as would gradually raise body temperature, cause pyrexia, whilst those during the day were such as would reduce any increase of body temperature so caused.

In the meteorological records above given I have bracketed the atmospheric conditions during the night which, from comparison with those which raised body temperature in the spinning and weaving sheds, must cause pyrexia. I have also bracketed those conditions during the day which I think must reduce any increase of body temperature so caused.

In the way described above I think that atmospheric conditions such as those at Culebra produce a fever of intermittent type. But if the heat and dampness and stagnancy of the air is as marked during the day as during the night such fever would assume a remittent type. These intermittent and remittent fevers which arise under such atmospheric conditions

have, since they were first differentiated, been known as mal'arial fevers, and were at first believed to be caused by the bad atmospheric conditions under which they became prevalent, and hence the name given to them—mal'arial fevers.

ATROPHODERMIA BIOTRIPTICA IN NATIVES IN THE ANGLO-EGYPTIAN SUDAN.

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Introductory.—"Biotripsis or Life-wear" is a term introduced in 1909 by Cheatle for those trophic changes which occur in old age in skin which has been subjected to the greatest exposure of the wear and tear of life, but the cutaneous conditions described under the terms "senile atrophy" and "biotripsis" do not occur all over the body, nor in every old person. It is, therefore, obvious that they must depend upon other factors than mere physiological old age.

As the only reference to this condition in the Tropics, as far as we know, occurs in the "Manual of Tropical Medicine," by Castellani and one of us, and as nothing so far has been written on this subject as seen in the Anglo-Egyptian Sudan, we venture to bring forward the following remarks in the hope of stimulating interest in this skin affection.

Cutaneous Atrophies.—In order to understand the position of "biotripsis" in tropical skin diseases it is necessary to review very briefly the present position of our knowledge with regard to atrophy of the skin, which is generally called *Atrophodermia.*

The term "atrophodermia" should only be applied to degenerations of the properly and fully developed skin, and the term *Aplasodermia* should be given to those conditions which are caused by insufficient development of the skin, and which are often called false atrophy or congenital atrophy, as it must be incorrect to consider as an atrophy a condition which arises from the fact that the normal development has ceased at some stage of embryonic life.

Atrophodermia may be divided into two groups, viz.: *Atrophodermia symptomatica,* due to some injury or disease; and *Atrophodermia idiopathica,* or primary atrophy of the skin.

The latter group, with which alone we are at present concerned, is usually held to include the following cutaneous affections:—

(1) Atrophodermia idiopathica progressiva;
(2) Atrophodermia chronica atrophicans;
(3) Atrophodermia maculosa;
(4) Atrophodermia senilis;

to which are sometimes added Fuch's blepharochalasis and Breisky's kraurosis vulvæ.

Our attention in the present paper is restricted to those forms of cutaneous atrophy which have been described under the rather misleading terms of *atrophodermia senilis* or atrophia cutis senilis.

The older writers on skin diseases, such as Alibert, do not appear to have studied these conditions, and it is due to the labours of Kaposi, Neumann, Unna, Hutchinson, and Schmidt, that we possess our present-day knowledge.

Kaposi distinguished two conditions under the term Atrophodermia senilis, viz.:—

(*a*) Atrophodermia senilis simplex.
(*b*) Atrophodermia senilis degenerativa.

The *simple senile atrophy* is quantitative, and is characterized by all the tissues undergoing reduction in size or number, or both; while the *degenerative atrophy* is qualitative, and specialized by the changes which the connective tissue of the corium undergoes.

These two divisions of senile atrophy of the skin do not satisfy fully all the clinical appearances which are visible in old people in the Tropics; nor, indeed, in temperate climates, as special characters appear in those parts of the skin which are most exposed to the wear and tear of life.

The first reference to these changes appears to have been made by Head and Sherren in 1905, but unfortunately we have no means of obtaining their paper at present.

It is due to Cheatle that these conditions have become realized, as he markedly drew attention to the subject in 1909, giving the name of *Biotripsis* to the affection, which converted in dermatological phraseology would be Atrophodermia biotriptica, but we will defer giving details concerning his views until a later paragraph.

In 1911 Sequeira drew attention to the fact that in certain occupations, *e.g.,* seamen, coachmen, agricultural labourers, and the like, the exposed parts of the skin become very like those observed in senile degeneration, thus indicating that all forms of so-called senile atrophy had nothing whatever to do with old age.

In 1913 Castellani wrote the section on "Biotripsis" in the second edition of the "Manual of Tropical Medicine," by himself and one of us, and illustrated it by a photograph. This is the first time that the condition was mentioned as occurring in the Tropics and in the Sinhalese, in whom it is common.

Dr. C. Christy, whose long and varied experience of the African Tropics is probably unequalled by other medical men, informs us that a similar appearance of the skin is common in many parts of tropical Africa, occurring on the apex of the shoulders and over the deltoid, as well as on the shins, in elderly natives, both men and women. He does not believe that the condition is directly due to old age or exposure, but to some neurotrophic process.

From 1913 up to the time of writing we have failed to find any further reference to this subject.

Iconography.—Illustrations of biotripsis may be found in the plate facing p. 1412 in the *British Medical Journal* of June 20, 1909, and in fig. 630 on p. 1639 of the second edition of the "Manual of Tropical Medicine," by Castellani and Chalmers, 1913.

Geographical Distribution.—As far as we know the so-called *Atrophodermia senilis* has only been studied in the white skin in Germany and England, and biotripsis has only been investigated clinically in England and in the native skin in Ceylon, while we add the Anglo-Egyptian Sudan, in which we have studied a similar condition clinically and histologically.

Racial Distribution.—It appears to have been only recorded in Europeans and Sinhalese, and now we bring forward a case in a male Sudanese, in which people it is said by Miss Bradford, of the Khartoum American Mission, to be common in old women.

Bodily Distribution.—The affection which we are describing has been seen in the hands of Europeans by Cheatle, and in the legs in Sinhalese and Sudanese; but there is no reason why it should not occur in other parts of the body if exposed to similar influences and in suitable subjects.

Ætiology.—The cutaneous conditions described under the terms senile atrophy and biotripsis, as we have already stated, do not occur all over the body in every old person. It is, therefore, obvious that they depend upon more conditions than merely physiological old age. For example, in the case to be described below the area of the skin affected was that of the legs, and in Sinhalese it was the same. In Cheatle's case it was the skin of certain portions of the dorsa of the hands.

This points to some other factor or factors in addition to age, and this fact has been emphasized by Cheatle, who has suggested that one factor may be exposure to the wear and tear of life, and he thinks that this is related to neurotrophic changes; but he admits that it is difficult to account for biotriptic changes. This view receives support from the observations of Sequeira, quoted above, in which he states he has seen similar conditions arise in persons who are not old, but in whom the affected skin has been exposed to the vicissitudes of the weather in England.

The point which we wish to emphasize is that the condition appears to us to be pathological and not physiological, because:—

(*a*) It does not occur in every old person.

(*b*) It occurs in only limited areas of skin in any one case.

(*c*) It may occur, according to Sequeira, in people who are not old, but in whom the affected area of skin has been exposed to the weather.

Morbid Anatomy.—The morbid anatomy of senile atrophy of the skin has been studied in white skin by several observers, but most notably by Neumann and Unna.

As far as we know, however, no one has investigated the changes to be found in the atrophied skin of old natives in the Tropics, nor are we aware of any researches upon the histology of biotripsis.

In order to examine microscopically the condition which we nave met with, a small piece of skin was removed by a biopsy from the glazed atrophied area, depicted on Plate I, fig. 2.

The piece of skin was fixed and hardened by the picric acid method, described by MacLeod in his book on "The Pathology of the Skin." It was then embedded in paraffin and cut, the resultant sections being subsequently coloured by hæmatoxylin and eosin, by Gram's stain, and by Weigert's special method for demonstrating elastic tissue.

A low-power view of one of these sections is shown on Plate II, fig. 3. Commencing with the epidermis it is at once noticed that the whole layer is thinner than normal, measuring in places over the papillæ only about 42 microns in thickness from the basal layer to the superficial aspect of the stratum corneum other than that lifted off as scales.

The *stratum germinativum* (Plate II, figs. 4, 5 and 7) appears to be normally connected with the corium and to consist of the usual one or two layers of cells, according to the part examined.

These cells appear to be normal in all particulars, with two exceptions, viz., they are smaller than usual, and perhaps a little more heavily granular than is customary, but if this is really so the difference is not considerable. The nuclei are as a rule normal, but some few have been observed to be vacuolated. The protoplasmic fibres connecting cell to cell appear normal.

The *stratum malpighii* (figs. 4, 5 and 7) is thinner than usual, and though the cells, their nuclei and their protoplasmic fibres, appear to be normal still they are more laden with pigment (fig. 7) than is usual, and this applies also to some of the more superficial cells of the layer.

The *stratum granulosum* (fig. 6) is composed of one layer of very elongated and very granular cells the nuclei of which appear normal.

Oehl's *stratum lucidum* (fig. 6) is well developed and several cells thick, and is usually difficult to separate from the horny layer.

The *stratum corneum* (figs. 4 and 5) is much thinned and its superficial layers are so loosely connected as to show almost a network in vertical section of the skin. It is not easy to say where the stratum lucidum ends and the stratum corneum begins as a rule, although this is evident in fig. 6.

With regard to the corium, the *pars papillaris* appears to be less developed than it should be and the vessels to be more dilated than normal, otherwise there is no obvious change (fig. 7).

The *pars reticularis* is mainly characterized by its dilated small vessels and lymphatics as well as by the diminution of the connective tissue corpuscles and bundles (figs. 3 and 4). There is no sign of any inflammation nor of any granular nor hyaline degeneration in this layer.

In the subcutaneous tissue the sweat glands may be seen, but no adipose tissue (figs. 3 and 4). No hairs appear in any of the sections examined, and no sensory corpuscles were observed in the papillary layer of the corium, nor were many wandering cells observed in any part.

The elastic fibres do not appear to be reduced in size or number (fig. 4).

Pathology.—As far as one can judge from the

morbid anatomy, the pathology appears to be a simple atrophy brought about by several etiological factors, among which one often stands out, viz., old age, but this may be only apparent and not real.

This simple atrophy in our case did not appear to affect the elastic tissue, or at all events not out of proportion to the other tissues of the skin. The sweat glands also did not appear to be atrophied; on the contrary the lumina of the acini appeared to be rather dilated.

Clinical Description.—In some inhabitants of the Anglo-Egyptian Sudan the skin on the legs presents a peculiar atrophic appearance, the general character of which may be realized by examining Plate I, fig. 2, which represents the right leg of an old Sudanese aged about 55, and by comparing this with Plate I, fig. 1, which depicts the left leg of a healthy, vigorous Sudanese man aged about 30.

If this is done a considerable number of differences will at once become apparent. The skin covering the leg in the old man is seen to be shrunken and to have lost its natural lines, while it has become distinctly darker in tint and is marked by whitish lines which indicate the cracking of the superficial epidermal layers to form the white scales which are sufficiently obvious.

In the lower part of the leg the changes have progressed further than they have just below the knee, where the early stages, consisting of shrinking of the skin and scaling of the epidermis, may be noted. In addition, it may be mentioned that the skin is much less elastic than is normal.

The skin of the dorsa of the feet, of the thighs, and of the arm showed no changes, and was not atrophic like that of the legs, nor did it possess the scales.

Diagnosis.—The chief diagnostic points are: The shrinking and glazing of the skin in exposed parts of the body generally, but not invariably, in old people associated with hyperpigmentation and scaling.

Histological examination reveals simple atrophy of the skin associated with increase of pigmentation, but without special atrophy of the elastic tissue.

Differential Diagnosis.—Atrophodermia biotriptica has to be differentiated from the other forms of Atrophodermia, viz.: From Atrophodermia idiopathica progressiva, and the allied Atrophodermia chronica atrophicans (synonym: Acrodermatitis chronica atrophicans), and also from Atrophodermia maculosa and Atrophodermia senilis, as well as from the forms of Atrophodermia which are secondary to some other cause, *e.g.*, Atrophodermia symptomatica.

From *Atrophodermia idiopathica* it may be distinguished both clinically and histologically by the absence of any signs of hyperæmia or inflammation.

From *Atrophodermia chronica atrophicans* it can be diagnosed by the absence of the laxity (anetodermia) of the skin, and by the absence of a history of a preceding inflammation.

From *Atrophodermia maculosa* it is recognized by the atrophy being diffuse and not limited to round or oval circumscribed areas of skin, and also by the absence of anetodermia.

From *Atrophodermia senilis*, if there is such a thing, *i.e.*, a degeneration of the skin due to physiological old age, which appears to us to be most doubtful, it may be separated by noting the fact that it occurs on localized areas of skin, in which it is possible for some other factor to be at work in addition to old age and, moreover, by the fact that it may occur in people who are not aged.

From the degenerative form of senile atrophy it is easily differentiated histologically by the fact that the elastic tissue is not atrophied, and that the connective tissue fibres do not lose their definition and are not clouded with granules.

From the many forms of *Atrophodermia symptomatica* it may be diagnosed by the absence of any obvious precedent injury or disease.

Nosology.—Having given our views as to the etiology and pathology of the condition, and having described the points we have observed with regard to the morbid anatomy and the clinical appearances, we can now discuss its position in cutaneous nosology.

In the first place, it will be observed that the pathological and clinical features agree more or less with those given for simple senile cutaneous atrophy.

Cheatle, however, is quite correct when he says that the appearance of the skin in an old person varies in different parts of the body, and that the changes on those parts which are exposed to the greatest wear and tear of life are so marked as to deserve a term to themselves.

To illustrate his point, he describes and figures the changes in the skin over the second metacarpal bone in both hands of an old woman where it was shiny, smooth, inelastic, greatly pigmented, and associated with whitish cicatricial areas.

Cheatle's biotripsis appears to be allied to the affection we describe above, and which we have frequently seen in Ceylon, but the point to be emphasized appears to us to be not so much its relationship to old age as to some other obscure pathological condition which may be neurotrophic in character, as Cheatle suggests, and which in its turn may be primarily induced by atmospheric exposure, as mentioned by Sequeira; but whatever view is taken, one must agree with Cheatle that it is difficult to account for these biotriptic changes.

We, therefore, are of the opinion that Cheatle has brought forward a cutaneous atrophy not dependent upon physiological old age *per se*, but upon some as yet obscure pathological factors which are at work both in the Tropics and in temperate climates in European and native races alike.

In order not to complicate nomenclature, it appears to us that the term *Atrophodermia biotriptica* suitably covers these conditions, and is in keeping with cutaneous nosology.

Prognosis, Treatment, Prophylaxis.—It is impossible to persuade a native to attempt to remedy or prevent such a trivial affection.

Acknowledgment.—We have much pleasure in acknowledging the kind suggestions which Dr. Christy has made to us during the preparation of this paper.

Khartoum,
January 26, 1915.

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ILLUSTRATIONS.

(Most of these illustrations may, with advantage, be examined by means of a lens).

PLATE I.

FIG. 1.—The leg of a young vigorous adult Sudanese, showing *normal skin*. Photograph.

FIG. 2.—The leg of an old Sudanese, showing *Atrophodermia biotriptica*. Photograph.

PLATE II.

FIG. 3.—Vertical section of *atrophied skin*. Note the general atrophy and the absence of fat. Hæmatoxylin and eosin. × 80 diameters. Photomicrograph.

FIG. 4.—Vertical section of same skin as fig. 3, but treated by Weigert's *Elastic Fibre* Stain. Note how plainly the elastic fibres show, also the loosening of the cells of the stratum corneum to form scales. The dilated lymphatics and blood-vessels, as well as the absence of fat, should also be observed. × 190 diameters. Photomicrograph.

FIG. 5.—Vertical section of same skin as fig. 3, to show the *Epidermis and its pigment* in an area not forming scales. Gram's stain. × 1,200 diameters. Photomicrograph.

FIG. 6.—Vertical section of the *stratum granulosum* and the *stratum lucidum* from the same skin as fig. 3. The stratum lucidum is separated into two parts by a tear in the section. The stratum granulosum shows one cell overlapped by parts of two adjacent cells, but in many sections there is not this overlapping. Gram's stain. × 4,100 diameters. Photomicrograph.

FIG. 7.—Vertical section of the *pars papillaris corii* from the same skin as fig. 3. Stained with hæmatoxylin and eosin. × 1,200 diameters. Photomicrograph.

OBITUARY.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 1, 1915.

THE FOOD SUPPLY OF THE WORLD.

EVEN now in many countries the food supply is deficient, both in quantity as well as in quality, apart altogether from the question of scurvy and beriberi, which is as important in the Tropics as typhoid fever in cold climates. There are indications that the shortage will be even greater in the future, be that future time near or remote.

It is of interest to consider the various ways that those connected directly and indirectly with the Tropics will be affected. Firstly, the shortage of food will affect the health of residents in tropical countries, who are more or less dependent on imported meat, the lack of which may so lower their

stamina, partly by deprivation of their usual food, and also by increasing the amount of locally produced food to which they are only partially accustomed. It must be remembered that the present shortage of beef, the main variety of meat imported into the Tropics, is already felt both in America, England, and the Continent of Europe; from which the tropical supply is only the surplus amount that can be spared, and its loss will be more felt as the shortage increases. Hence there will be an increase in tropical morbidity.

The shortage of meat is mainly a shortage of beef, which is and will be more acute than lack of other flesh food. Now, though every one knows to kill calves and cows when the demand exceeds the supply tends to create an ever-increasing deficiency, yet in non-tropical cattle districts there are no apparent widely felt influences to limit the killing of cows. Yet for centuries in India the cow has been considered sacred, the animal whose milk forms the chief luxuries and nourishment of the whole population, hence to eat its flesh is only less revolting than to eat the flesh of one's child or mother. To look away from India, in the Sudan the value of a wife is estimated in cows. After the Mahdi had slaughtered many men and much cattle, there was a slump in the price of wives, but now the value of wives has risen because the natives will not kill their cattle. In other countries cattle, including buffaloes, are used for draught purposes, as well as for tilling; so that killing the cows reduces the amount of stock, starves the soil, and generally interferes with agriculture, and so limits the food supply, as well as reducing material wealth.

Apart entirely from economic reasons, in India the cow is looked upon as a divinity and cow-killing is considered a sin, so that for economic and imperial reasons "cow-killing should be prohibited." Outside the Tropics it would lead to an increased trade in beef to India, with a corresponding advantage to Europe in the increased export from India.

Secondly, in many countries there will be a falling off of various food imports, or an increase of products lacking in requisite and nutritive properties necessary to health, especially felt by residents in tropical countries, where native articles of diet do not supply the deficiency. For example, imported milled rice is deficient in vitamines, which may be only supplied in small quantities by indigenous food. Besides, if the rice crop of the world is not deficient, the demand in some countries in Europe may divert the supply from the Tropics, especially those parts where from climatic or other reasons the shortage may be so great as to cause a famine, which, from lack of railways and other means of transport, cannot be effectually relieved.

Thirdly, an increased shortage in Europe may be supplemented by an increased food supply from the Tropics. Perhaps the greatest shortage of all is in the fat requirement, and fatty foods—butter, cream, oil, eggs, &c., which are expensive as well as requisite. The fat may be supplied from palm kernels in the form of margarine, the other oils can be used for cooking and other purposes, so saving the more expensive milk fats used as butter and cheese. This will lead to a transfer of money to the Tropics, to the benefit of those who send as well as those who receive.

The question of sugar is a somewhat complicated one, involving as it does the subject of protection, but it is possible that sugar can be produced as cheap or more cheaply in the Tropics than in Europe. Apart from the consideration as to whether or not excess of sugar is consumed, it yet remains certain that sugar is an important article of diet and its supply a matter of considerable financial responsibility.

Nowadays little is heard of the dictum of Malthus, from which so much harm has resulted. Malthus, in the early nineteenth century, estimated that the population increased faster than the food supply. Hence the injudicious, but honest, desire to limit the birth-rate. The estimate is erroneous for two main reasons, firstly science now permits a hitherto unknown increase of produce from a given area. Thus England produces on an average thirty-two bushels of wheat per acre, whereas the fertile Argentine —which may be almost described as the reserve granary of the world—only produces twelve bushels per acre, which might be largely increased by agricultural implements and phosphates, the by-product of the iron trade. Again, intensive garden culture means an increased return of labour to the land in a healthy occupation, and a great increase of dietetic articles of considerable value.

To look at the matter from a world-wide standpoint, with the same amount of labour the Tropics produces many times the wealth and food produced in a cool climate. Hence it is only a question of time till English-speaking people are induced to settle in tropical countries. The all-important problem of health is the only obstacle, and it can be eliminated. Modern tropical sanitation not only protects the men and women, but with such protection they live as comfortably and healthily as in Europe, so that one may look forward to the time when Europeans will people many tropical countries, with a population as dense as India, for the great hindrance that has impeded tropical production and immigration is lack of tropical sanitation.

Hence future good may result from present difficulties, so that many highly valuable provinces and countries, now of small utility on account of unhealthy conditions prevailing, may become of incalculable value, when prevailing unhealthy conditions are removed by eliminating malaria and other indigenous diseases, and the prevention of foreign invasion as of plague is perfected.

To increase the food supply of the world cow-killing in India should be prohibited, and in no country should the native economic principles be disregarded. There is a need for an increased supply of beef, machines, manures, and other aids to agriculture. In the Tropics there is a possibility of an increased export of grain, seeds, oils and fat. Above all, attention must be directed to tropical medicine and hygiene.

Annotations.

German Menus in War Time.—Schwalbe (*Deut. med. Wochenschr.*, February 4, 1915) lays most stress on rye bread eaten with jam or soft cheese. Meats can well be omitted at meals. Sweetened decoctions of oatmeal or barley may be used as beverages and also to replace bread in part. The above is, of course, a necessity, for the author allows, as a rule, a certain amount of wheat-and-rye bread, sausage, tea, coffee, and cocoa with milk and sugar, and a little butter. For the hearty midday meal he names a variety of soups, all of which contain potato along with legumes and scraps of meat. Wheat-flour porridge made with skim-milk is also recommended. Potatoes, cabbage, beets, turnips, green beans, &c., may be cooked together with a little fat meat. Sauerkraut may be cooked with pea-porridge, white beans with prunes, potatoes with dried apples or prunes; and dumplings are good. All kinds of cereals may be cooked in skim-milk and highly sweetened. A few of the cheaper fish, like herring, may be eaten. Meat economy is secured by days of abstinence, especially in warm weather. Fruit stews, tomatoes, &c., may be eaten as relishes. For supper rye bread and cheese forms the staple, with a little bacon or sausage after a meat-free dinner. Potatoes may be baked and eaten in the skins, with herring or bacon instead of butter. Generally speaking, anything left over from dinner may be eaten for supper. Children must eat largely of cereals cooked in skim-milk.

Hygiene in the Field. — Hesse (*Deut. med. Wochenschr.*, February 4, 1915) calls attention to the difficulties of feeding troops at the front, especially in attempts to give them fresh meat, which is at times impossible, owing to local conditions. The use of canned meats is then advisable, and these, along with preserved vegetables, constitute the materials for a tasty meal. When there is beef to slaughter, examination of the meat cannot be vigorously conducted, and thorough cooking must be guaranteed. These meats are eaten fresh; in other words, when tough, and make great demands on the teeth and digestive organs. However, the kitchen wagons, by cooking fresh meats at a very high temperature and under pressure, can overcome this drawback to some extent. These vehicles, through which it is possible to carry warm food to the front, are familiarly known as "goulash cannon." The field kitchens are provided with kettles which hold enough food for 200 persons each. In these vessels meat, potatoes, and vegetables are cooked together, while the bread ration is prepared in field bakeries. Feeding troops while on the march is naturally a different and most difficult problem. The bread, perhaps just from the oven, is packed tightly in wagons and readily becomes mouldy in addition to being at times half baked. It can only be claimed thus far that the commissariat has been satisfactory. Some trouble during mobilization and rapid shifting of troops is unavoidable and hence expected. Fear of water shortage has been groundless, and although water must come largely from the supply of the conquered no evidence has been brought home that any intentional sophistication has been practised by the enemy. Dangers from water, so commonly expressed in bowel complaints, have been largely averted by drinking the abandoned native wines of the French. Cognac and other spirits have been taken only when well diluted, for fear of confusion with wood alcohol, which is somewhat used for beverage purposes (naturally with due precautions) in Belgium and France. Defecation is provided for in several ways —the regular privies of the conquered peoples (often shockingly primitive) serve for quartered troops; extemporized trenches, &c., are used in the bivouac, the contents covered with layers of earth, and, finally, the same recourse obtains in trench life, which is well adapted for defecation in extemporized latrines, dirt being always available to cover the dejecta. All these receptacles are provided with toilet paper, although, as a rule, any attempts at cleanliness in trench life are farcical.

Injuries from Aviators' Darts.—Grutzner (*Münch. med. Wochenschr.*, February 8, 1915) states that, launched at an altitude of 1,500 to 2,000 metres, the force of impact of a dart upon the earth's surface would on an average be 3·428 kilogram-metres. An infantry bullet weighing 10 grm. shot with a muzzle velocity of 885 m., the impact would be 8·55 kgm. The dart cannot penetrate bone, but has a way of traversing the soft parts in a peculiar fashion. It is able to pierce blood-vessels, penetrate several of the important viscera at once, and set up peritonitis. If the entrance wound is overlooked diagnosis may be very difficult. A case is given of an artillerist who while serving his gun chanced to look upwards for the presence of aeroplanes. At this instant he was struck in the left shoulder, and disabled. Borne at once to the field hospital a small entrance wound was found at the anterior border of the clavicle. An exit wound was found on the inner aspect of the left thigh. Death occurred from collapse within twenty-four hours. There was extravasation of blood in the peritoneal and left pleural cavities; the mesentery was pierced in four places and the small intestine in twelve, and the dart had also passed through the stomach.

War Nutrition and Sick Diet.—Strauss (*Deut. med. Wochenschr.*, January 21, 1915) states that one sees no evidence of famine in Germany. This, however, is somewhat offset by the ignorance or indifference of the so-called educated classes who pay no attention to the cessation of imports. Physicians alone can bring the truth home to these people. A separate aspect of the problem is feeding the sick and the invalid. Those who have become more or less incapacitated by corpulence, as far as this is due to over-nutrition, now have patriotic motives for correcting their habits, and should at once go upon

an anti-fat regimen. The diabetic, on the other hand, has a large fat requirement, and fatty foods —butter, cream, oil, eggs, &c.—are expensive. He can get his fat, however, from fatty cheese, nuts, and olive oil. Protein he can obtain economically from smoked or dry salted meat or fish. When a meatless diet is to be carried out white cheese must be a standby. Legumes are now expensive, and the so-called "cutlets" made from them must be prepared instead from grits, &c. Milk, especially skim-milk, yeast, gelatine, may also be used as proteins or protein sparers. Sufferers from gastro-enteric disturbances are usually forced to depend on eggs, butter, cream, fine starches, &c. Milk, butter, and eggs, even if sold at high prices, will be available, but cream may be prohibitive in price. To replace it white cheese and even rubbed up Swiss cheese may be used. Sugar is abundant. Wheat flour now contains 30 per cent. rye meal, and the finer grades of flour and starchy foods will perhaps not be available. Flour for baking (Zwie-back, rolls, &c.) will contain 50 per cent. of potato meal or other admixture. Indian meal is a possible substitute for wheat flour. It is, of course, not well suited for the invalid. An ideal cheap dish for dyspeptics would appear to be potato flour cooked in skim-milk. Rice is getting short, as well as cocoa and chocolate, which means a hardship for the invalid. The healthy should deny themselves a little so that the invalid may have his proper nourishment. This may mean a more rapid return to complete health.

Abstract.

THE THERAPY OF SYPHILIS.[1]

By Adolph Rostenberg, M.D.

According to Blaschko 33 per cent. of syphilitics die of the disease, and in 50 per cent. of these cases death is caused by syphilis of a vital organ.

In spite of all the latest investigations there is still, even among our leaders, a wide discrepancy as to the best methods of combating this disease. Wechselmann, for instance, who undoubtedly has as much, if not more, experience than any other syphilographer, employs only salvarsan; and Buschke, his associate in the same hospital, rejects salvarsan altogether and still adheres to mercury.

Between these two extremes, however, the consensus of opinion of nearly all other investigators is that the rational therapy lies in a combination of both these drugs. We know that both are chemical agents which either kill the spirochætes or at least arrest their development. By experiments it has been shown that each one attacks the micro-organism in a different way, therefore it seems plausible enough to use both weapons simultaneously against this disease. Furthermore, the combination of the two drugs is not only more effectual than each alone, but the toxic effects on the patient's organism are less dangerous. Salvarsan, by killing the spirochætes, sets free a large amount of endotoxins which would be greatly diminished if mercury is used immediately before or right after. Furthermore, the dose of each drug, in order to have its effects, will also be much smaller when used in combination than when each alone is employed.

The best results are obtained when a case presents itself in its earliest primary stage. By experiments on animals, according to Neisser, it has been shown that the syphilitic virus circulates free in the blood in the very beginning. Salvarsan, injected into the vein, will meet the enemy in the open field and achieve a great victory; in fact, perhaps cause a complete sterilization of the patient. But to achieve such a brilliant result two important preliminary conditions must be fulfilled. Firstly, we must educate our patients not to hide their venereal diseases, and not to go to a friend or a quack for treatment in the beginning; and secondly, we must be able to make an early diagnosis; the old dictum, wait for secondaries before you start treatment, would be considered ignorance and negligence to-day. We have to make our diagnosis at once and start treatment accordingly. Unfortunately, the Wassermann test fails us here; we rarely get a positive reaction before the sixth week after the infection. Therefore, should we be in the slightest doubt from a macroscopical examination as to the real nature of the chancre, it is our duty to look for confirming evidence and to examine for the spirochæte. But we must look for them in the right way. The staining method with India ink, which is becoming rather prevalent in this country on account of its simplicity, is not reliable. The dark field illumination should be the method of choice; here we often find the spirochæte at a first glance and in large numbers, while the same specimen stained with India ink and examined for a long while does not reveal any at all.

Having thus established our diagnosis we must begin our treatment at once. Now we have the best chance not only to cure the chancre but to cure the disease. The spirochætes are still localized in the primary lesion and perhaps the nearest lymph nodes. A single dose of salvarsan may kill them all or at least paralyse their further development and prevent their further spreading. The result would be Ehrlich's therapia sterilisans magna, which, indeed, is not an impossibility in such an early case. But, unfortunately, so many recurrences have been observed since this dictum of Ehrlich was published that nobody to-day, not even Ehrlich himself, stops at one injection; we give several and use mercury in addition. Should we excise the chancre? A good many authors recommend this operation, if feasible. I myself have never done it and only insist upon a clean surgical dressing, using calomel as a dusting powder.

I start my treatment with from 0·30 to 0·45 of neo-salvarsan, according to sex, weight, and robustness of the patient. I personally use neo-salvarsan almost exclusively, and believe its effects to be as

[1] Abstracted from the *Medical Record*, February 27, 1915.

good as from old salvarsan, although a good many claim to have seen better and more lasting results from the latter. But the easy preparation of neo-salvarsan, which dissolves readily in water without any addition, recommends its use more to the general practitioner. Besides, it is easier to use neo-salvarsan in a concentrated solution, a method which is simple and safer than the infusion method. The so-called concentrated method does away with all cumbersome apparatus. The drug is dissolved in 10 c.c. of freshly distilled and sterilized water, drawn up in a record syringe, and slowly injected in the median vein under aseptic precautions; the mixing of blood with the solution will show that the vein has been correctly entered. This is a very simple procedure and can be readily performed in one's office. Patients should lie down right after getting home, but even this has been neglected in a good many instances and no ill results have been noticed. The intravenous method is used exclusively, except in cases in which, because of a very fat arm or poorly developed veins, an introduction of the needle would be impossible without a dissection of the vein. To avoid this rather objectionable operation, the intramuscular method is used in these cases, either in a watery solution or an oily suspension, both painful compared with the absolute painless intravenous method. After the first injection patients are given four or five more in this way, the second eight or ten days after the first, and if the first was well tolerated, a dose of from 0·45 to 0·60, then two weeks afterwards from 0·60 to 0·75, and repeated in another two or three weeks, gradually increasing to 0·9. Immediately after the first injection of neo-salvarsan weekly injections are given of 10 minims of a 10 to 20 per cent. emulsion of the salicylate of mercury—10 to 15 in all. This procedure constitutes one course of treatment. About four weeks after the last injection a Wassermann test is taken, and in a good many instances the report is negative, which means that the patient is apparently cured and his infection has been aborted. Should we stop now with all further treatment and control our patient's future only by subsequent repeated Wassermann examinations?

It is safer to extend the treatment even in spite of negative symptoms for a period of about two years, giving two to three courses as described above in the first year and one to two in the following. Now if two years have thus elapsed and the patient has clinically and serologically been free from all symptoms, can we pronounce him absolutely cured and promise him that he will remain well? In all probability yes, but if the patient is very anxious and if he contemplates marriage, we have two more tests which will conclusively prove his status. The first one is a provocative Wassermann test, as proposed by Gennerich and Milian. The patient gets a medium dose of salvarsan, and his blood is examined for two weeks, daily for one week and then on the fourteenth day. If the Wassermann at any time becomes positive again it would prove that there was a latent focus of living spirochætes somewhere, which the salvarsan incited to activity again, proving that the patient had not been cured as yet. The second test is an examination of the cerebro-spinal fluid, especially indicated where the patient has at any time shown some cerebro-spinal symptoms, as severe headaches and dizziness. Here we examine for the so-called four phases of Nonne, which are a positive blood Wassermann, a positive spinal-fluid Wassermann, a lymphocytosis, and a positive globulin reaction. The details of these reactions belong to the laboratory.

Hitherto we have been considering the treatment advised in the primary stage of syphilis. But the great majority of patients come for the first time when the secondaries have developed, usually with a roseola, mucous patches, papules, a general adenopathy, &c., sometimes the induration of the primary lesion being still in evidence. The clinical diagnosis, as a rule, does not offer much difficulty here, but is corroborated by a Wassermann test, which in 100 per cent. will be positive now. In this stage the patient is a great menace to society, as his lesions abound in spirochætes and even an innocent infection through contact is not impossible. The effects of salvarsan might be too explosive now, as the large number of killed spirochætes may liberate a too large amount of dangerous endotoxins, so is preceded by one to two injections of the milder acting mercury and then followed with salvarsan in the same way as outlined before. In this stage an abortive cure cannot be expected: the recurrences will be frequent in spite of rational treatment. An intermittent salvarsan-mercury therapy extending over three to five years and even longer may be necessary, the Wassermann test with all its modifications being our only guide as to a final cure. Heidingsfeld investigated a series of 442 cases being treated *lege artis* for two and a half years and found only 77 per cent. consecutive negative Wassermann reactions, whereas 23 per cent., in spite of all treatment and absence of clinical symptoms, persisted in a positive reaction. What shall be done with these so-called latent cases, where the spirochætes apparently have become salvarsan-fast; should we still persist in treating them? According to the experience of Heidingsfeld the results are better when such cases are left alone for a while, treated only with general tonics or other arsenic preparations like the cacodylate of sodium. Some of those persistent positive Wassermann reactions thus became negative finally.

In the very late forms of syphilis, known as the tertiary stage, where besides the skin and mucous membranes the bones and viscera also become affected, in addition to salvarsan and mercury, our old standby, potassium iodide, should not be forgotten, and it should be potassium and not sodium iodide, or any of the modern organic iodine preparations, and only large doses are effective. If the patient does not show any idiosyncrasy to iodine, a dose up to 100 gr. a day is given either in Vichy or milk. Potassium iodide is also very useful in the so-called malignant forms of lues. But here salvarsan has shown its most brilliant effects and has

actually been a life-saver. Lesions which formerly would have led to mutilation or death by causing destruction of bones or other important organs or perforations of large blood-vessels yield sometimes to one injection of salvarsan, the progress is arrested and eventually a complete cure achieved. In addition to salvarsan here the more active calomel injections are used instead of those of salicylate of mercury, which are also given as an emulsion and in the same strength as the latter.

A routine examination of the spinal fluid has shown that a syphilitic infection of the nervous system is very prevalent. Ravaut in France has shown spinal fluid changes in about 70 per cent. of secondary syphilis. Fordyce concludes in his treatise on the treatment of syphilis of the nervous system that upon the dissemination of the spirochætes throughout the body the nervous system bears the brunt of this general invasion. This may manifest itself as a meningitis with or without clinical signs and with only spinal fluid changes. It has also been shown that the involvement of the nervous system takes place very early. Cerebral syphilis has been seen as early as four months after the infection, and cerebral facial palsy simultaneously with the roseola. Naunyn says that the majority of infections of the nervous system take place during the first year, after which there is a decrease in frequency.

The brilliant discovery by Noguchi of living spirochætes in the nerve tissues of paretics and tabetics proves without a doubt that these cases can no longer be considered as para- or metasyphilitic infections but as true cases of syphilis of the nervous system. In the therapy of these unfortunate conditions salvarsan was tried with great expectations. Unfortunately the results were rather poor; in paresis almost nil, in tabes a little better.

The positive spinal fluid findings in these cases have, therefore, recently suggested the method of introducing the remedy directly in the cerebrospinal canal. The rather poor results obtained heretofore are explained by the fact that the salvarsan, because of anatomical conditions, cannot enter through the blood into the spinal fluid, and thus does not come into direct contact with the spirochætes deposited in the nerve tissues. Therefore, Swift and Ellis have advised the injection of the so-called salvarsanized blood-serum directly into the spinal canal. The technique of this is as follows: One hour after an ordinary intravenous dose of salvarsan about 40 c.c. of blood is withdrawn, sufficient to produce 12 c.c. of serum. This serum is heated and diluted to 30 c.c. with decinormal saline solution. This mixture then is injected into the spinal canal after an equal amount of spinal fluid has been withdrawn, after which the patient is kept in bed for twenty-four hours.[1] The results obtained by this method are very encouraging, but still too recent to allow of any definite conclusions.

[1] The serum is of additional value, as it may be assumed to contain important antibodies which may also play a large rôle in the result.

In the treatment of hereditary and acquired syphilis in children salvarsan along with mercury is also of use. The technique here is naturally more difficult. The intravenous method is also the most rational one. If the median vein on the elbow is selected, a dissection will be necessary in most cases; to avoid this the jugular, or, according to Holt, one of the veins of the head, especially the postauricular, may be used, as these fill up greatly when the child cries, thus facilitating the entrance of the needle. The dose in infants up to 8 months is about 0·075 of neo-salvarsan; in older children about 5 mgr. to each kilogram of body-weight. As children stand mercury well in addition calomel or inunctions of gray ointment is used, and for infants bichloride baths by putting one ordinary bichloride tablet in 5 gallons of water.

Salvarsan contains 34 per cent. of pure arsenic; it coagulates albumin, and when the cell is over-irritated, especially the excretory epithelial cell, its function is impaired or arrested entirely. If the kidney is involved, anuria will set in, the elimination of salvarsan will become impossible, arsenic will accumulate in the body and produce its toxic and fatal effects on the vital centres. Therefore, cases must be excluded in which elimination would be imperfect, as in diseases of the liver, kidneys, and intestines. Severe forms of circulatory disturbances as uncompensated heart lesions, myocarditis, aneurysm, advanced forms of arteriosclerosis, advanced tuberculosis, all cachectic conditions, and alcoholism preclude its use or at least demand very great caution, provided all these conditions have not been directly caused by the patient's syphilitic infection itself.

If these precautions are carefully observed, 99·9 per cent. of all salvarsan injections will be entirely harmless or at least followed only by slight after-effects, which are almost negligible, such as a moderate rise in temperature, chilly sensations, some vomiting and diarrhœa occurring from four to eight hours after the injection and usually disappearing entirely the following day. According to Wechselmann and others these by-effects are not due to the salvarsan at all, but to impurities in the water, containing dead saprophytic bacteria and chemical substances, originating from the glass vessels in use, the so-called "Glass and Wasserfehler." This explanation seems rather very far-fetched, and the majority of men to-day consider these phenomena as toxic effects due to the arsenic.

Another phenomenon is the so-called Jarisch-Herxheimer reaction, a vasomotor disturbance, showing itself to a different degree in different organs, whereby the specific lesions assume a more pronounced character; the roseola, for example, appears larger and of a deeper reddish hue, which lasts for a few days. The cause of this seems to lie in a liberation of endotoxins during the killing of the spirochætes, these toxins dilating the capillaries and causing an œdema in the adjacent tissues.

Some authors have explained the appearance of the so much feared "neurorecidives" as a late

Herxheimer reaction. These neurorecidives are forms of paresis or paralysis of the cerebral nerves, especially the acusticus, opticus and facialis, also meningeal irritations, leading to epileptiform attacks; quite a number of such cases followed the use of salvarsan when it was first introduced. The experience with atoxyl, an arsenic preparation, which led to total blindness and deafness, was still fresh in the memory of the profession and naturally many voices were raised, condemning salvarsan also. But soon other investigators, as Ehrlich, Wechselmann, and Neisser, tried to show that it could not be the salvarsan which caused this damage, as the only cure for a neurorecidive was another prompt injection of salvarsan. They believe the cause to be insufficient treatment, whereby some foci of unkilled spirochætes are left behind, especially in the cerebro-spinal fluid, where a penetration of the salvarsan by diffusion had not taken place. These remaining foci, thus only irritated, will assume the character of a primary sore, that is, they will produce a severe local inflammatory reaction, causing pressure on the affected nerves, especially where they enter the small foramina in the skull.

In contradiction to this explanation by Ehrlich and his followers, Finger and others claim that salvarsan, because of its neurotropic properties, creates a *locus minoris resistentiæ* in the central nervous system, so that the syphilitic process finds there an easier foothold, or else the infection causes a lessened resistance of the nervous system to the toxic effects of the salvarsan. Others believe that the salvarsan is without influence and that these neurorecidives would have appeared anyway in the natural course of the disease. Whatever the real cause may be, these complications are much more rare now since such large single doses of salvarsan are not used in the beginning and since we use mercury with it.

Fortunately, these neurorecidives are in most cases not fatal, but in spite of all precautions fatalities after the use of salvarsan have occurred and will occur in the future, though much more rarely. Mentberger in Strassburg has compiled an analysis of all the salvarsan deaths which had been reported up to 1914 (274 in all), but a more thorough revision by Schmitt in Würzburg brought this number down to 172, showing that 102 of these reported cases could not stand the test. The victims were mostly young individuals between 20 to 40, who, except for their lues, had intact internal organs and an unaffected nervous system. The fatalities occurred in all the stages of syphilis and independent of the dose and number of the salvarsan injections. In a few of these cases the patient died suddenly immediately after the injection. The second more frequent type showed a more subacute form coming on in a day or so after the injection. The symptoms were severe headaches, general weakness, vomiting, diarrhœa, often incontinence of the sphincters, dyspnœa, cyanosis, convulsions, and coma followed by death in three or four days. The autopsy revealed a serous meningitis or punctate hæmorrhages in the brain, indicating a hæmorrhagic encephalitis. In the third group there was a total or partial suppression of urine with hæmaturia and convulsions, followed by death, the autopsy showing a severe degeneration of the kidneys and liver, just as is experimentally found in arsenical poisoning. But even in these desperate cases, according to very recent investigations, a promising remedy has seemingly been advised. Ehrlich, discussing in the *British Medical Journal* in one of the issues of May, 1914, the type of salvarsan deaths apparently caused by hæmorrhagic encephalitis, points out that the enormous dilatation of the blood-vessels found in these cases was probably due to the fact that the normal regulator of the vascular system, adrenalin, was not present in sufficient quantity in the blood, this condition being found in cases of Addison's disease and in hypoplastic processes occurring in the suprarenals causing a so-called status thymolymphaticus. Melian in Paris took up this point and has shown that accidents, developing immediately after an injection of salvarsan, characterized by blue-red swelling of the face, lips and eyes, and dyspnœa, may be completely avoided if adrenalin is injected previous to the salvarsan. He also showed that severe diarrhœa and suppression of urine threatening life was cured by repeated injections of adrenalin. He even has saved an otherwise hopeless case of encephalitis by means of an energetic adrenalin treatment. The same favourable results from adrenalin have been reported by a few other men in similar cases.

Review.

MALAY POISONS AND CHARM CURES. By John D. Gimlette, M.R.C.S., L.R.C.P., Residency Surgeon of Kelantan, one of the Protected Malay States. Pages viii + 127. 1915. J. and A. Churchill, 7, Great Marlborough Street, London. Price 3s. 6d. net.

The author supplies a useful account of the somewhat voluminous, but somewhat inaccessible, literature related to the Federated Malay States. The book describes injuries caused by fishes and other members of the animal kingdom. Particularly interesting are the chapters devoted to jungle and village plants. Inorganic preparations are also discussed.

The author has performed a difficult task with considerable care and judgment, giving full information as regards natural history, botany and chemistry. The suggestions made as to the scientific utility of investigation are well worthy of consideration. We would emphasize the hints given for the avoidance of injurious effects from tropical products and their utilization in pharmacy.

The question of "charms," which appears at the head of every page, may interest those concerned with the mental attitude of the Orient.

Original Communications.

THE DISEASES MOST MET WITH IN PERSIA, AND HOW THEY AFFECT EUROPEANS.[1]

By DONALD CARR, M.D.Camb.
Church Missionary Hospital, Isfahan, Persia.

IN dealing with this subject, "The Diseases most met with in Persia, and how they affect Europeans," I wish to make it clear that my remarks refer entirely to the Central Persian highlands, and more particularly to that part in the province of Isfahan, which has been my headquarters for the last twenty years, and not at all to the Persian Gulf littoral, which has a more tropical climate.

The Isfahan plain, situated 5,300 ft. above sea-level, enjoys what I can only describe as a most delightful climate. The rainfall is very slight, only 4 to 6 in. in the year. The London winter weather makes the Briton long for the clear, crisp, sunny, frosty winter of Central Persia. There are probably not a dozen days in the year in which we do not see the sun at all. Even in mid-winter the sun has a good deal of warmth in the middle of the day, but hard frost reigns supreme at night. For two to three months the minimum temperature at night will be from 28° F. downwards. Twice I have known it go below zero, and every year it reaches 5° to 10° F. for a longer or shorter period. Ice is stored in deep pits, and the winter cold is invariably sufficient to supply us with an abundant and cheap supply of ice through the warm season. The summer is dry and fairly hot. Practically no rain falls from the beginning of May till the end of October, all vegetable growth being dependent on irrigation. For a couple of hours in the middle of the day for three months the temperature in the shade will be from 100° to 106° F., but the evenings are pleasant, and the nights are seldom oppressively hot.

The small amount of rain and snow falls chiefly in December and the first four months of the year. It would be difficult to imagine any season in any part of the world more delightful than the late spring and the autumn in Isfahan. For four months mosquitoes and sand-flies are troublesome, and we have to sleep under nets.

With regard to the other two mission stations of the Church Missionary Society in Central Persia, the climate of the Kerman is very similar to that of Isfahan, but perhaps more moderate both in summer and winter, while that of Yezd is even drier than Isfahan, and perhaps 5° to 6° F. hotter, the altitude being only 4,000 ft.

Possibly owing to the altitude, and also the atmospheric dryness, Persia has a reputation for making people "nervy." I have certainly known more than one man, for instance, once a bold rider, who has lost all his nerve for that sort of exercise. My own experience has been the contrary, for at the end of twenty years I am less nervous than I was before that space of time, and I believe that others can say the same of themselves.

With the exception of enteric fever, to which I shall refer later, there is little to be said respecting the ordinary diseases of the temperate zone. Enjoying a first-class climate, we live a very open-air life, and are on the whole a healthy community.

Diseases of the heart are not specially prevalent. Among the natives valvular affections are met with, though acute rheumatism is seldom seen. Diseases of the lungs among Europeans are almost unknown. As a young man I constantly suffered from bronchial attacks, but I have been entirely free from them in Persia. One of my fellow-missionaries, who used to be a martyr to asthma at home, has hardly if ever had an attack since he came to this country. The natives, especially the middle-aged and elderly, suffer much from chronic bronchitis and emphysema, doubtless in great part due to the almost universal practice among both sexes of smoking the kaliyan, or hubble-bubble. The smoke is inhaled and irritates the bronchioles, causing frequent coughing both during and after the smoking.

Phthisis has lately been very much on the increase among the natives, though Europeans are seldom affected. I only remember one European developing phthisis in Isfahan, a Swiss lady who had seemed very robust, but who developed a severe type, which ended fatally in Switzerland, to which she returned, in about a couple of years. The increase of the disease among the natives seems to be due to the pernicious habit which they have of sleeping, especially in the winter, many together in a small room without any ventilation. Possibly opium smoking, more prevalent than ever of late years, has increased the incidence of the disease by lowering the resisting power. Tuberculosis of the bones and joints is extremely frequent among natives, and it is in these cases that tuberculin, used in conjunction with operative treatment, is specially valuable.

Of disorders of the kidneys and liver little need be said. Bright's disease in its various forms is not rare among natives, though Europeans seldom suffer. The entire absence of alcohol drinking among the village population, and also among the bulk of the Mohammedan townsfolk, explains the relative rarity of affections dependent on chronic alcoholism. A few members of the Moslem community drink to excess. On the other hand, amœbic hepatitis and tropical abscess is not uncommon among natives, though I have never seen a case in a European.

Among abdominal diseases, diarrhœa and dysentery are both serious among the natives, and have caused a good deal of trouble at times among Europeans, the summer diarrhœa of children being specially frequent among both Europeans and natives, and in the latter case often fatal.

[1] A paper read before the Association of Medical Officers of Missionary Societies.

Appendicitis is very rare, but I have seen a few isolated cases. Excepting that bread is made from stone-ground flour, steel-ground flour being unknown, the diet of Europeans is very much the same as at home. I only remember one case of appendicitis in a European within twenty years, and that occurred just lately in a lady who had but recently come to the country. The absence of appendicitis in the East is not easy to explain. As far as Persia is concerned, while in most ways the European mode of living does not differ materially from that at home, there are two points in which there is a marked difference. (1) There is far more air space per person in the towns, and we live much more out in the open air. (2) The difference in the drainage systems. The sanitary system is of the simplest, but it suffices for the East. There are plenty of bad smells in the streets, but any poisonous gases are freely diluted with air, and in the East we never live over drains, which, however well constructed, may be leaky. There is no system of drainage under the houses. The European system is necessary for Europe, and when quite perfect has doubtless no danger, but we know that it is not always perfect. Living so much in the fresh air and never having the possibility of leaky drains, we, it appears, are removed from the possibility of a most potent cause of the lowering of the general vitality, and this may be a reason why "the East" is so free from such a disease as appendicitis. Anyhow, the fact remains that both Europeans and natives are remarkably exempt.

The natives suffer quite frequently from arthritic pains, loosely called "chronic rheumatism," but in great part due to different types of septic infection.

Of the usual specific infectious fevers we get our fair share, but they come in runs. We have an epidemic of some kind almost annually, usually of a different type each year. We ring the changes on scarlet fever, measles, mumps, whooping-cough, diphtheria, typhus, &c. The Europeans who have not been protected by previous attacks often fall victims, and we have had cases of all these diseases among them, yet none have so far ended fatally. Of typhus we have had very severe epidemics, attacking hundreds, and possibly thousands, of persons. On the whole the mortality among those who are looked after is not large, and we have not had a death among Europeans, though many have suffered in these epidemics. Pediculi are credited with being the probable transmitters of typhus, and among the poorer Persians pediculi are universal. Visiting the poorer Persian houses and mixing freely with the people, it is impossible for the Europeans to keep entirely free from these pests.

Small-pox is endemic and is always with us, but I have never known it to be epidemic in Isfahan. There has been one severe recent visitation in Kerman, and small-pox was rife also in Yezd a few years ago, when two Europeans, one adult and one child, were affected, but this is one of the diseases which may be and ought to be entirely avoided by Europeans. I am seldom asked to treat a case. The Persian looks on the disease in a fatalistic way. Little treatment is adopted. If the patient dies, he dies, and if he recovers, he recovers. In either case it is "the will of God." Inoculation is practised to some extent among the natives.

Tropical Diseases.

Of the strictly *tropical* diseases we have but few. The ubiquitous *malaria* does not leave us alone, but it is, on the whole, of a mild type. Quartan ague is very common, especially in the autumn, but is easily got rid of. Benign tertian is less common. Æstivo-autumnal is frequently met with, but this again is not of a virulent type. I can only remember seeing one case of what one might call malignant malaria. A man was brought in quite unconscious, and his blood was found to be swarming with parasites. He was given injections of quinine, but the case ended fatally soon after admission. Mild malaria is fairly frequent among Europeans, but seldom causes serious trouble.

Dysentery is of very frequent occurrence among natives and is occasionally seen in Europeans, though among the latter I have not known any case either fatal or followed by any serious sequelæ. *Cholera* is only an occasional visitor. In 1892 there was a very grave epidemic with many thousands of deaths. The disease entirely disappeared until 1904, when we were visited by another equally serious outbreak, which again carried off many thousands of victims, amongst whom were a few Europeans. Isfahan, probably owing to its better water supply, suffered much less than any other large town, and no Europeans there contracted the disease.

Relapsing fever is common in the Kerman district. I only actually know of one European victim. The lady in charge of the Women's Medical Mission in 1912 had a fairly severe attack, which I verified by finding the *Spirillum obermeieri* in the patient's blood. I had not heard of the disease in Western Persia till last year, when I saw four cases, in all of which the spirillum was easily found. It was curious that of these four cases, which occurred within a very few weeks of one another, two arrived from the North with the fever on them, one developed it three days after arriving from the West, and the fourth had only reached Isfahan a week before from the South. It is, therefore, very doubtful whether it has ever been contracted in the Isfahan district.

Oriental sore is extremely prevalent among natives. It seems to be of a less severe type than that met with in Baghdad. It is widely spread over the East, and in each country has its local name. The Baghdad boil and Delhi sore become with us the *fulfa* or Armenian sore. It is also known as *salak*, from the fact that it lasts about a year, *sāl* being the Persian for year. It affects exposed parts, most commonly the face, though the hands also are often attacked. A number of Europeans have been affected, the hand being the most common site, but it has also occurred in Europeans on the face. If protected from irritation the sores usually will not

ulcerate, in which case no permanent scar will be left. The Leishman-Donovan body is very readily detected in the sores, and I have twice found similar bodies in sores clinically differing very widely from Oriental sore.

We have also a number of cases of sores, the unusual appearance of which directed special attention to them, and in which we have found numbers of spirochætes, many of them of a large type, associated both with the *Bacillus fusiformis* and also with other sausage-shaped bodies, which I have not seen described elsewhere, except in a paper by two German investigators in the Sudan. The nature of these sores is still uncertain, and whether the spirochætes are causal or merely saprophytic is not yet clear. They require further investigation. So far we have not found any in Europeans.

What one can only classify under the unsatisfactory term of *simple continued fever* frequently occurs in Europeans as well as natives. Short attacks of fever frequently occur for which no definite cause can be found, and which are not, as a rule, serious. There is abundant scope for investigation in this direction.

Lathyrism has been met with, though not commonly. It is a nervous affection simulating lateral sclerosis, caused by eating bread made largely from the seeds of a plant of the Lathyrus family, a species of pea. These seeds, usually grown for sheep and cattle, have been used in certain districts by the poor in times of scarcity. The disease is more of scientific than practical interest, and does not, for obvious reasons, occur in Europeans.

Venereal disease among natives of the towns has been increasing to an alarming extent. It is difficult to deal with owing to the social habits of the people. They have a system of legalized prostitution, it being lawful for a man to make a temporary union, called a *sighă* marriage, for a day, or a week, or a month, or any period that he desires. There is a regular class of women who employ themselves in this way. Venereal disease carries no shame or disgrace with it, and is spoken of quite freely among the people. If an upper-class man suffering from such an affection comes for treatment, as they often do, with three or four friends, he will at once say openly before them all what is the matter with him. A large number undoubtedly contract the disease in an accidental way. I have seen primary sores at the bend of the elbow from venesection, on various parts of the body through infection from a dirty razor, as well as such parts as the lips, tongue, &c. Three young men came to me one morning with Hunterian chancres in the middle of their backs. That is a favourite site for wet cupping, which is largely practised, and these three had been treated in this way three weeks before by the same barber, the implement used being an infected razor. They seemed to bear the barber no ill-will when I told them what was the matter, and probably accepted it as " Kismet," fate, the will of God. I have never had to treat the disease in a European resident in the country.

Though syphilis is so prevalent, it is comparatively seldom that signs of the congenital disease are seen in the young adult. I can remember very few instances of " Hutchinson's teeth " or interstitial keratitis in the course of twenty years, though I have been always on the look out for them. Infected women suffer from frequent miscarriages, and many syphilitic infants are born alive. I take it that it is a case of the survival of the fittest, and in a country like Persia, where at best of times the struggle for existence of the infant is a hard one, and there is a very large infant and young child mortality, the congenitally affected having a heavy handicap seldom survives.

ENTERIC FEVER.

By far the most important disease with which we have to deal, from the point of view of the European, is enteric fever. It might almost be called the scourge of the European, and it is the one disease really feared and really difficult to avoid. Europeans have suffered from enteric far more than from any other serious malady. When I speak of enteric, I use the term loosely, as up to the present we have not had the means of distinguishing between fevers caused by the true *Bacillus typhosus* and others caused by similar allied bacteria, which I fully believe will be found to be the cause in some cases. Undoubtedly the water supply is chiefly to blame. In Isfahan, where the disease is less prevalent than in any other large city, we have a better supply, each house having its own well. In Yezd and Kerman, and indeed most other cities, the case is different. Running water is the main supply, the well water being brackish and unfit for drinking. The habits of the people are disgusting. Their religion teaches them that running water is good to drink, and even if stagnant it is all right provided that the tank or receptacle in which it is stored is above a certain size. They relieve the calls of nature beside the water, and wash themselves and their clothes and the bodies of their dead in the streams, often just above a place where their neighbours are drinking. In these towns it is necessary to exercise the greatest care about drinking water; but, by way of emphasizing how difficult it is to avoid all sources of infection, I would mention one European family of three who took what I should consider almost extravagant precautions to escape infection. The drinking water, the child's bath water, the washing-up water, the dish cloths, and all other things that could be boiled were boiled, yet two out of the three contracted enteric.

Typhoid inoculation is without doubt a most valuable prophylactic, and should, I think, be regularly carried out in the case of Europeans going to Persia. In connection, however, with inoculation we have to remember that vaccine prepared from *B. typhosus*, while protecting fairly well against true typhoid, protects to a very much less extent against *B. paratyphosus* A and B, and perhaps not at all against other less closely allied bacteria which may cause a fever ~~clinically~~ similar. In the 1911

Report of the Wellcome Laboratory at Khartoum, four cases were reported of a fever clinically simulating typhoid, but which were all found to be caused by a particular organism closely allied to the *B. cloacæ*, which was obtained from blood culture in each case.

In December, 1910, I was inoculated against typhoid. Just nine months later, in September, 1911, I was laid up with a fever which lasted seven weeks, and while not being quite a normal and typical case of enteric, it bore a sufficient clinical resemblance to call it typhoid for want of a better name. I was invalided home, and shortly after my arrival my blood was examined for Widal's reaction by Major Cummins, at the Laboratory of the R.A.M.C., and was found to be quite negative to *B. typhosus*, as well as to *B. paratyphosus* A and B. I mention this to emphasize the fact that there are probably other bacteria which may cause fever clinically like typhoid, and which are at present unrecognized. They need to be worked out, and should it be found that either *B. paratyphosus* A or B was prevalent, or that any other particular bacillus was frequently the cause of a typhoid-like fever, the question of the advisability of using a combined vaccine of *B. typhosus* with one or more of these other prevalent types, as has been advocated recently by Castellani, would arise. Also, if, as in this case, a typhoid-like fever should follow within a short time after typhoid inoculation, it need not necessarily be inferred that the inoculation has been ineffective.

SUMMARY.

Inland Persia has, on the whole, a distinctly healthy climate. With the exception of enteric there is little to be specially feared. At the same time, our experience shows that missionaries after five years urgently need furlough. This is probably due to excessive expenditure of nervous energy. There is always more to be done than is possible, and in this fine climate we have plenty of energy and the tendency is to overwork. Though a missionary may have been quite free from illness, it becomes pretty evident during his fifth year of service that he needs a change. Nervous irritability begins to manifest itself in a variety of ways, differing according to the natural temperament.

The great difficulties attending travel in Persia are still obstacles to the recognition of that country as a satisfactory health resort and a field for missionaries who do not enjoy robust health.

In the dim future, when railways remove the terrors of the long mule journey to and from the coast, we may expect to welcome Cook's tourists, and to see Inland Persia become something of a health resort; but until then, though it has a splendid climate when you get there, it should be reserved for those who have plenty of energy and are able and willing to rough it on the long and fatiguing journeys to and from the coast.

BRIEF NOTE ON THE TREATMENT OF A CASE OF KALA-AZAR.

By Aldo Castellani, M.D.

Director, Government Clinic for Tropical Diseases, Colombo, Ceylon.

In previous papers (*Journal of the Ceylon Branch of the British Medical Association*, &c.) I have given the results of the treatment of cases of yaws by using tartar emetic, sodium salicylate, sodium bicarbonate, and potassium iodide. It may, perhaps, be of some interest if I give, very briefly, the results obtained in a case of kala-azar by using a somewhat similar line of treatment.

The patient was an Indian coolie, aged about 22, said to have been in Ceylon three months. He certainly contracted the infection in India[1]; he had a low irregular fever, and the spleen was greatly enlarged. He seemed to be very weak, but he flatly refused to enter the Clinic; he agreed, however, to live on the outer veranda, a relation bringing him his food there daily. He remained there for a few weeks, and then continued to come as an out-patient for about six months. He steadily improved, the fever ceased, and the spleen got much smaller. At first he attended regularly, later on very irregularly, and finally, considering himself practically cured, he ceased to come at all.

Spleen puncture—to which, as well as to many intravenous injections, he submitted quite willingly, only resting for about half an hour after the operation—was made twice, once at the beginning of the treatment, and again four months after the treatment had started. *Leishmania donovani* was present in large numbers the first time; on the second occasion it was also present, but apparently in distinctly smaller numbers. The patient received, at various periods, the following treatment:—

(1) The so-called "yaws mixture," which I have introduced for yaws.

(2) Intravenous injections of a solution of tartar emetic and liq. Fowleri.

(3) Intravenous injections of tartar emetic.

The so-called yaws mixture contains tartar emetic 1 gr., sodii salicyl. 5-10 gr., potass. iodid. 1 dr., sodii bicarb. 15 gr., to 1 oz. of water. The mixture is pharmacologically a very inelegant one; it is cloudy and has a sediment owing to the presence of a large amount of bicarbonate of soda. The bicarbonate of soda, however, decreases the emetic properties of the mixture and prevents to a certain extent the symptoms of iodism. In frambœsia patients three doses (1 oz. each) daily are given, diluted in four times as much water for adults; half-doses to children aged 8 to 14 years, and one-third or less to younger children, for ten to twenty days. The kala-azar patient in question had three doses daily on alternate weeks, for about two months; but I had to reduce the potass. iodid.

[1] Kala-azar is a rare disease in Ceylon, practically every case being an imported one from India; in fact, some observers have denied the occurrence of indigenous cases in Ceylon.

to 15 gr. per dose, as apparently he did not stand it so well as did yaws patients.

Solution of Tartar Emetic and Liq. Fowleri.—The solution is made up of tartar emetic 30 gr., liq. Fowleri 100 minims, aq. dist. 100 c.c. One or 2 c.c. diluted to 4 or 5 c.c. with sterile distilled water was injected intravenously twice a week for nearly three months.

Solution of Tartar Emetic.—A 2 per cent. solution was used. It was given by intravenous injection, the dose of the tartar emetic given in this way each time being 2 to 10 cg. The patient was treated with these injections the last two months; he was then coming very irregularly and he had not more, on the average, than one injection every ten days. He had also some more yaws mixture, as this was very convenient for him, coming as he did at irregular intervals.

Conclusion.

An Indian coolie suffering from kala-azar was treated at intervals with my so-called "yaws mixture," which contains tartar emetic, salicylate of soda, potass. iodid., and bicarbonate of soda; he had also intravenous injections of tartar emetic, and tartar emetic and liq. Fowleri. The improvement was remarkable. I am inclined to believe that the drug which had the greatest part in causing the rather striking improvement was tartar emetic.

Literature.

1914. *Journal of the Ceylon Branch of the British Medical Association.*

Chief Intestinal Lesions encountered in One Thousand Consecutive Autopsies in Manila (B. C. Crowell, *Philippine Journal of Science*, September).—Excluding intestinal parasites and tumours and the lesions in bubonic plague, intestinal lesions were seen in 292 cases. Asiatic cholera stood first numerically. Second was intestinal tuberculosis, and attention has been drawn to the possibility of the occurrence of dysenteric symptoms in this condition and to the perforation of intestinal ulcers in three cases. Typhoid was present more frequently than either entamœbic or bacillary colitis, and these typhoid cases showed a high percentage of perforations (30 per cent.) and hæmorrhages (12 per cent.), all of the cases being among Orientals. Entamœbic and bacillary colitis have been encountered with less frequency; liver abscesses occurred in 29 per cent. of the entamœbic cases, and in two cases the intestines had perforated. Bacillary colitis was present more frequently in children than in adults. Nine cases of duodenal ulcers were encountered, six of which had perforated, and fifteen cases of peptic ulcer of the stomach occurred in the same series. Severe anæmia and symptoms referable to the gall-bladder were prominent in some of the cases of duodenal ulcer. Unclassified, probably non-specific, inflammatory lesions of the intestines, especially in infants, occupy an important place.

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"TOO OLD" FOR WAR WORK.

Many men and women at the present time are considerably chagrined at being told they are too old for war service. In the case of medical men the age limit has a peculiarity all its own and not to be ranked alongside of other departments of the Services. In the Royal Army Medical Corps the conditions of service have altered considerably since the "old regimental" days when the medical man was attached to a regiment and was part and parcel of its establishment. He had no drill to learn, no men

to command, and but little was expected of him professionally, beyond routine duties. Age, therefore, was not an important question for the "regimental doctor"; but nowadays the medical man is a company officer to begin with, and has his duties as other company officers in the other departments of the Army, and in addition he has his duties as a sanitarian and as a practitioner, be it as a surgeon or physician. When he attains his majority and a still higher status, company work is left behind and he becomes an executive officer, with few or no clinical duties, and serves as an organizer or a sanitary adviser.

In civil life the reverse is the case, the greater the age attained the more does the clinical work increase, and until physical incapacity renders the doctor unable to go his daily round there is no departure therefrom.

From civil hospital staff appointments he is usually required to retire at 60, be he surgeon or physician, owing presumably to incapacity for active work due to age. In the case of a surgeon this may be a good rule, for after 60 the hand may become unsteady or the keenness of his enthusiasm may have worn off. In the case of the physician the necessity for retirement is less apparent, for with increased experience he becomes more valuable and impaired manipulative powers play no part in his work.

As regards the surgeon, he becomes and should become a consultant surgeon after 60, an adviser of when operations should or should not be done instead of doing them himself: a most valuable man and one too seldom met with to-day. Surgery is something more than mere operations; there is a science of surgery as well as art, but the art—represented by the operating surgeon—holds the field to-day, well-nigh to the exclusion of the other.

Since Sir James Paget's day we have been practically without a consultant surgeon in the real sense of the term. When the surgeon of to-day gives up operative work he usually retires altogether. A great loss to the community surely, for in these days when operations are rampant and seem the only line of treatment worth considering, never was a man of the Paget or the Jonathan Hutchison stamp more called for. He does not appear, however, to be forthcoming. Yet we can ill afford to be without him.

In the sphere of civil practitioners and "war" employment many heartaches have been caused by the "too old" fetish. Doctors are wanted for medical and surgical work in our Army and Navy to an extent unheard of at any time in the country's history. They are being advertised for widely; and nobly has the profession responded. Many have given up their practices or paid another man to do the work at a rate much above what they themselves earn "at the Front." A number of most capable and valuable men have, however, been refused because they are six months or so over the age prescribed for the moment. The age limit may, however, be, and has been frequently advanced, say, a month or so later; but by this time the doctor has, with the enthusiasm crushed out of him, gone back shamefacedly to his home and his practice and begun the daily round once more. He is in the prime of life and of experience as a practitioner and at the most valuable stage of his life, yet he is refused because he is six months or so over age. Were he ten years older he would be more valuable still, yet is he cast aside as unfit to attend to the sick and wounded. It cannot be surely because he is physically unfit, for war work does not impose upon him the physical endurance required in private practice, however strenuous the war work may be. War service has its busy moments no doubt, especially during the few days after a battle, but during the lull there is a slack time in which to recuperate, a period unknown in private practice when the doctor is always on duty and always working at high pressure. Who refuses this man? Who is the judge that decides that this man is useless for his country's needs? Whoever sends him back as useless assumes a great responsibility; he is depriving the sick and wounded of the most valuable advice and treatment, and prefers evidently handing them over to young men just qualified, to whom the practice of their profession is as yet a sealed book.

Another phase of the matter is the man of experience who is advised to join the R.A.M.C. if he wishes to do work at the Front or in home hospitals; men of ten or twenty years' experience, who have had not only their professional experience in private practice, but have been attached to a hospital, say in the provinces, as a surgeon, or physician upon the staff, are urged to join; but they are offered the rank of lieutenant, that is, the lowest grade in the military medical scheme. The case of a father who offered his services and was to be given the rank of lieutenant in the corps of which his son, aged 24, was a captain, points to an absurdity which requires removing if the soldier is to receive the full benefit of the skill of the medical profession. Going from private medical practice to military practice has no equivalent in other branches of the Service; the clerk, the mechanic, or the student, leaves his work and is given rank as an officer in the combatant branch of the Army, sometimes as a sub-lieutenant and sometimes a higher rank. The doctor, on the other hand, comes as an expert from civil life to military life, so he is no amateur, as is the bank clerk or the student leaving his books for the camp, but comes with a ripe experience and offers that for his country's need; yet he is gazetted at the lowest rung of the ladder as the amateur soldier is. Medical and surgical experience is more readily and more fully gained in civil practice than in the limited sphere of military practice; there is no difference when, how and where medical knowledge is acquired, yet is the ten or twenty years' experience of the civilian cast aside, and he gets neither credit nor rank for accumulated knowledge, however skilled he may be. It would be well for the country and for the soldier were this condition of things altered. A man with ten years' experience in private life when he joins should at least be given a captain's rank, and a man with fifteen and twenty years' experience the rank of a major. It is inconceivable that the

country—that is, Parliament—would not insist upon this were the matter laid fully before them; and the wise and sympathetic men who have charge of the medical department of the Army and Navy at present would rejoice at some scheme of the kind. It only lies with someone to bring the matter forward in Parliament to have this absurdity removed. The too-old fetish and the offer of appointments to experienced medical men of only a lieutenant's commission in the R.A.M.C. is depriving the soldier of medical and surgical advice which the country can ill afford at present.

If in many branches of the public service, including the fighting branches, old men have been called on to take command by virtue of their experience, surely the same law should apply in medicine, where, after all, in the treatment of the sick, experience is the chief matter of moment. In no other profession does experience hold the same position as in medicine; each medical man is a store of knowledge in himself, which cannot be really handed on. Years in his case mean greater efficiency, and until actual physical incapacity affects him his added years are so much more to the national well-being. To throw this aside at a moment when all the national strength and knowledge is required is a waste of valuable material and should not be allowed.

One might extend something of the same kind of argument to nurses and nursing. Many offers of help by experienced nurses have been declined also owing to the "too old" idea; the wisdom of this is doubtful in the extreme.

In reference also to the employment of nurses another matter has come to light. Many British hospital nurses have come from the provinces and some from the ends of the earth, offering their services; they come with testimonials from doctors of the highest repute, yet because they have not been trained in a large hospital in a large town in Britain their services are declined. This is a condition of things to be deplored from many points of view. "Partial service" is also a question of moment. Many medical men can give several hours daily to attend hospitals in which soldiers are being treated. Yet many state that these services were refused; but we are glad to know an endeavour is being made to rectify the hitherto neglect of "partial service" now so freely offered by medical men.

Annotation.

Tetanus (Grundmann, *Berliner klinische Wochenschrift*, February 22).—The main point is to recognize the first symptoms, including slight difficulty in swallowing, sweating, starting at noises, bright light or sudden draughts, and dizziness, or twitching or stiffening of the muscles when they are tapped. The pulse was about 100 throughout the disease. Antitetanus serum was injected as soon as possible; the tetanus patient was kept in a quiet, dark room. Every hour some light digestible nourishment was given.

The wound was left at rest, any attempt to resect the tissues at this late stage merely opens up new blood and lymph vessel paths for toxins and bacteria. The tetanus toxin is absorbed so rapidly that any operation usually comes too late. In some cases a splinter of wood or scrap of cloth or straw was left in the wound and was spontaneously expelled later. He merely dressed the wound with iodoform, after cleansing with hydrogen dioxide, and injected around the wound 80 or 100 antitetanus serum units to catch the toxin as it spread, repeating this for several days. An intravenous injection of the serum was made daily also to neutralize the toxin in the blood, supplemented the first and third day by lumbar intraspinal injection of the same amount. He never witnessed any signs of anaphylaxis even when a total of 150 units had thus been administered for several days in succession.

Most of the deaths from tetanus are due to the excessive accumulation of waste products in the muscles from their intense and prolonged contraction. This is combated best with magnesium sulphate, and he uses this freely. He never witnessed any disturbance in breathing or any respiratory paralysis, although he makes a practice of injecting subcutaneously, three or four times a day, 20 c.c. of a 10 or 15 per cent. solution until the muscular contractions and rigidity have subsided. It is necessary to begin with tentative doses, not over 5 c.c., and increase them until slight general anæsthesia is induced. A dose of 5 c.c. of a 5 per cent. solution of calcium chloride or 1 mg. of physostigmin is used as needed. He never ventured to inject the magnesium sulphate into a vein or into the spine. The antitetanus serum treatment is kept up for from four to seven days. In conclusion, he warns that a tent cloth or blanket should be thrown over straw before a wounded person is laid on it. Also that the wounded lying next to one with tetanus should be given a preventive injection of serum. He had two cases of tetanus develop in a crowded ward sixteen and twenty days after the men had entered it.

Abstract.

THE PREVENTION OF BERIBERI AMONG PHILIPPINE SCOUTS BY MEANS OF MODIFICATIONS IN THE DIET.[1]

By Weston P. Chamberlain, M.D.

The enlisted men are Filipinos belonging to various tribes and gathered from all parts of the archipelago. There are about 5,200 men in the Scouts, located in nearly all portions of the islands. Organizations are frequently changed from one section of the archipelago to another, and the contact between the Scout soldier and the adjacent population is close and constant. Beriberi is at all times present among the civilian

[1] Abstracted from the *Journal of the American Medical Association*, April 10, 1915.

natives, and no effort is made to isolate the sick. Until the calendar year 1910 beriberi was a scourge to the Philippine Scouts. The total annual admissions from this cause ranged from a minimum of 115 to a maximum of 618, and there was a considerable death-rate and many discharges from the service for permanent disability. In spite of six years of vigorous effort to suppress the disease, a climax was reached in 1908 and 1909, when the total admissions for beriberi reached 618 and 558 respectively. During 1910 certain changes in the dietary of the native soldiers were inaugurated, and in that year the beriberi admissions dropped to fifty. In 1914 there were three admissions, in 1912 two, in 1913 none, and in 1914 only one up to June 30, when last reports were received.

In 1908 and 1909, when beriberi was at its worst among the Scouts, the ration supplied to these natives was that shown in Table I. The chief components

TABLE I.—RATION UP TO THE LATTER PART OF 1909.

Component articles	Quantities, ounces	Substitutive articles	Quantities, ounces
Beef, fresh	12	Bacon	8
		Canned meat	8
		Fish, canned	12
		Fish, fresh	12
Flour	8	Hard bread	8
Baking powder, when in field and ovens are not available	0·32	—	—
Rice	20	—	—
Potatoes	8	Onions	8
Coffee, roasted and ground	1	—	—
Sugar	2	—	—
Vinegar*	0·08	—	—
Salt	0·64	—	—
Pepper, black	0·02	—	—

* In this and the following ration table the vinegar measurement is in fractions of a gill.

were 12 oz. of fresh beef, 8 oz. of flour, 8 oz. of Irish potatoes and 20 oz. of rice. The rice furnished was a highly milled or polished grain imported from Siam.

A propaganda of education regarding the prevention of beriberi was started among the Scout officers, and on November 3, 1909, orders were issued by the division commander that the rice component of the native ration should be reduced from 20 to 16 oz., and that 1·6 oz. of beans should be added in place of the quantity of rice withdrawn. In March, 1910, the Scout ration was radically altered, as a result of the efforts of persons who wished to put native products into use as far as possible.

The ration was satisfactory as regards its beriberi-preventing qualities, but gave rise to a number of practical difficulties. Mangoes and camotes were hard to get in proper quantities, and the latter did not keep well. The Filipino rice was unsightly, and consequently aroused opposition among the men. Ginger root could not be made popular. Therefore the ration was changed to the form shown in Table II, which

TABLE II.—RATION FROM JUNE, 1911, TILL PRESENT DATE.*

Component articles	Quantities, ounces	Substitutive articles	Quantities, ounces
Beef, fresh	12	Bacon	8
		Canned meat	8
		Fish, canned	12
		Fish, fresh	12
		Hard bread	8
Flour	8	Soft bread	8
Baking powder, when in field and ovens are not available	0·32	—	—
Rice, unpolished	20	—	—
Potatoes	8	Onions	8
Coffee, roasted and ground	1	—	—
Sugar	2	—	—
Vinegar	0·08	—	—
Salt	0·64	—	—
Pepper, black	0·02	—	—

* Scout organizations will be required to use the entire allowance of the meat component, and not more than 16 oz. of rice per day to be used for each ration. The purchase of 1·6 oz. of beans per ration in substitution of the portion of the rice ration not drawn will be made, and use of as large an extent as possible of native products, such as camotes, mangoes and squash will be required.

has continued in force to the present date. This ration obviates the practical disadvantages of the preceding one, yet embodies all the features important for beriberi prevention, namely: *use of unpolished rice in an amount not exceeding 16 oz., and compulsory consumption of 1·6 oz. of beans.* The beans used are ordinary dried navy beans (for which mangoes may be substituted). The undermilled rice is of the highest grade, has a white pericarp, is palatable and not unsightly in appearance, and contains over 0·4 per cent. of phosphorus pentoxide.

The reduction in the amount of polished rice consumed by the Scout soldier, and the use of a certain quantity of beans or mangoes, was gradually put into practice, beginning in the latter part of 1909. *These two changes proved sufficient to eradicate beriberi, the disease disappearing before the substitution of unpolished for polished rice had been accomplished. I believe that the consumption of beans, to the daily amount of 1·6 oz., would unaided have prevented a recurrence of beriberi, but it would obviously be difficult to make sure that all the men ate their share of this article over long periods, and it is, therefore, much safer that the largest component of the diet, rice, should be of the unpolished variety and by itself sufficient to prevent neuritis.*

The cases which have occurred since August, 1910, can readily be explained on the assumption that certain soldiers did not consume the average diet as furnished to the company, and made up the deficiency by eating largely of polished rice outside of the military post, many of the Scouts being married, with families living near the Government reservation. Probably a number much larger than seven did this, but only the rare individual, who was especially susceptible to neuritis, so far reduced his supply of vitamines as to show symptoms.

During the year 1910 there were no improvements in the sanitary conditions among the Scouts, except the dietetic changes, which could account for the lowered incidence of beriberi observed in that year and persisting ever since. It will be seen from Table III that from 1902 there has been a gradual,

TABLE III.—RATES PER THOUSAND OF ADMISSIONS FOR BERIBERI AND FOR ALL OTHER DISEASES AMONG PHILIPPINE SCOUTS.

Calendar year	Beriberi	Other diseases
1902	121·42	1,489·14
1903	125·60	1,144·85
1904	74·62	948·59
1905	35·93	1,101·43
1906	36·98	1,138·27
1907	24·58	956·83
1908	121·53	786·24
1909	103·93	727·14
1910	9·22	738·67
1911	0·57	665·97
1912	0·37	616·79
1913	0·00	585·36

though not always progressive, reduction in the admission rates for diseases other than beriberi. This decrease, however, was no more marked, in fact was rather less marked, during the year when beriberi disappeared than at some other periods. The decrease in diseases other than beriberi is to be attributed to the steady improvement in the general sanitary situation among the Scouts. This reduction was not at any time paralleled by a corresponding reduction in the beriberi rates, for in 1908 and 1909 the beriberi admissions were greater than in any year except 1903. Since the year 1910, when beriberi disappeared coincidentally with the dietetic improvements, there has been a well-marked, steady reduction in the incidence of diseases other than beriberi. This decrease in morbidity should be attributed in part to the continued improvement in the general hygienic condition of the native army, and in part directly to the alleviation of vitamine famine by which the susceptibility to many other diseases is undoubtedly increased if the vitamine starvation is sufficiently marked to produce recognizable beriberi, and perhaps even when the deficiency is not present to such an extreme degree.

During the years prior to 1910 beriberi among the Scouts had been combated mainly on the assumption that the disease was infectious. The complete failure to prevent its occurrence by isolation and disinfection is clearly indicated by the figures in Table III. Beriberi has been greatly reduced, and in some instances eradicated, in the civil institutions in the Philippines by the application of the same dietary principles which have proved so successful among the Scouts. The disappearance of beriberi in the Scout organizations and in the civil institutions was not coincident with a decrease of the disease in the general population. On the contrary, at the date of its disappearance from the Scout organization, and for two years subsequently, beriberi was on the increase in Manila and was not abating in the provinces. Although a campaign of education has apparently diminished the incidence of beriberi to a considerable degree in Manila in 1913, yet the disease still prevails extensively in that city, partly because of the unwillingness of the native to use undermilled rice, and partly because of difficulty in obtaining such grain in the general markets. With the disease everywhere prevalent about the Scout garrisons, and with the native soldiers mingling with the diseased civilians in the most intimate manner, it seems inconceivable that the years 1911, 1912, and 1913 should have passed with only five cases among the Scouts if the malady were caused by an infectious agent.

The two following points are important:—

(1) *Many articles of diet, other than rice, are relatively deficient in neuritis-preventing vitamines.* Among these may be mentioned fine wheat flour, wheat bread, macaroni, "ship biscuit," sago, hominy, corn-starch, various breakfast foods, and possibly potatoes.

(2) *Exposing food to a temperature above a certain point decomposes the neuritis-preventing vitamines present.* A temperature of 120° C. destroyed some substance in undermilled rice, barley and rye, with the result that multiple neuritis developed when these foodstuffs were used as exclusive articles of diet for fowls. In a neuritis-preventing extract of rice polishings it was found in Manila that boiling, when prolonged for many hours, destroyed some or all of the vitamines present. It is probable that the process of sterilizing necessary for the preservation of canned foods, such as meat, beans and peas, destroys the beriberi-preventing elements originally present. It is well known that the vitamine necessary to prevent infantile scorbutus is destroyed by a temperature at or even below the boiling point, but the substances which avert beriberi appear to be somewhat more resistant to heat.

Therefore, when confronted by a syndrome suggesting beriberi it is unsafe to assume that the condition is not due to a vitamine starvation until the dietary has been studied most carefully, and from a point of view entirely different from that occupied a few years ago. Mere dependence on proper amounts of fats, proteins, carbohydrates, and salts is not sufficient. One must learn, by animal experiments if necessary, whether the essential components of the ration contain vitamines in quantities adequate to maintain nerve nutrition. It must further be determined whether or not vitamines, originally present in the various articles, are being in part or in whole decomposed by the culinary processes employed. Attention to these points will probably explain the occasional outbreaks of beriberi in lands where the disease is not endemic and where rice is not a food staple.

Furthermore, it is important to remember that beef (and possibly many other articles not yet studied) contains enough vitamines to prevent the development of neuritis, when fed exclusively to fowls, yet the quantity present is relatively small when compared with the amount found in beans, peas, mangoes, barley, peanuts, yeast, or the bran (polishings) of rice or wheat. Therefore, if the chief components of the

ration are greatly deficient in neuritis-preventing substances the addition to the dietary of a small amount of meat will not supply sufficient vitamine to prevent the onset of disease.

Whole wheat in the kernel, whole wheat bread made without yeast, whole corn, and undermilled rice can be fed indefinitely to fowls, as an exclusive diet, without inducing neuritis. Evidently in all these cereals the neuritis-preventing elements reside mainly in the outer coatings of the kernel (pericarp and aleurone layer). This has been abundantly proved in the case of the last-named grain, since neuritis does not occur among fowls subsisting on highly milled rice provided they receive a daily dose of polishings (bran) or an alcoholic extract of polishings. The use of this same extract, or of substances isolated from it, will rapidly cure polyneuritis in fowls, and beriberi in adults and infants.[1]

If beriberi is due to a specific deficiency in the food it may be asked why it is that only a relatively small proportion of the Oriental natives develop the disease, though nearly all are subsisting largely on a rice diet. The answer will be that the appearance of recognizable beriberi depends on facility in obtaining food and also on personal idiosyncrasy. Undoubtedly, the bulk of the labouring classes, as a result of poverty and racial custom, are much of the time on the verge of vitamine starvation. At some seasons of the year the harvest will supply cheaply and in relative profusion certain articles rich in vitamines, notably mangoes. The ingestion of these beriberi-preventing foodstuffs will raise the nerve nutrition of the Oriental temporarily above the danger point. Furthermore, when he cultivates his own rice, and prepares it himself by hand-pounding, the product will be relatively rich in pericarp, and so beriberi-preventing. If before the harvest season his home-raised supply runs out he must purchase rice, and will usually find for sale a grain highly polished and very low in vitamines. In some persons a larger amount of vitamine is necessary to maintain the proper metabolism of the nervous system than is the case in others. Thus we see patients with every grade of beriberi, ranging from the most trivial signs difficult to distinguish down to absolute prostration quickly ending in death. The quantity of food the individual consumes, as well as the quality of the ration, probably influences the result. This idiosyncrasy in incubation period, combined with the seasonal variations in food supply mentioned above, adequately explain why the bulk of the population are able to keep their vitamine demands supplied to an extent sufficient to prevent obvious or disabling signs or symptoms of beriberi.

[1] In the disease known among the Filipinos as "taon," and which Manila observers believe to be infantile beriberi, remarkable cures have been reported immediately following the administration of extract of rice polishings to breast-fed infants. Symptoms, like aphonia, which are due to nerve degeneration, of course improve only slowly, but the change in the general condition is as prompt and striking as that seen when fruit juice is used in the treatment of infantile scorbutus.

Translation.

THE TREATMENT OF INTERNAL LEISHMANIASIS.[1]

By G. di Cristana and G. Caronia.

Ever since internal leishmaniasis has been studied the high mortality rate has been constantly noted. The school of Professor Jemma, however, pointed out that there might occur, quite independently of any treatment, a certain percentage (7 to 14 per cent.) of spontaneous recoveries. The damage caused to a community by such a grave malady is by no means a negligible quantity in those countries it attacks, especially in certain parts of Sicily and Southern Italy, and even more so in India where entire villages are depopulated by epidemics of kala-azar.

Numerous attempts have been made to combat this terrible malady, but always with discouraging results. The various methods hitherto tried, the immunity therapy (Di Cristana, Caronia, Row) and the chemiotherapy (preparations of arsenic, fuchsin, quinine, mercury, iodine, &c.) have yielded no result.

Recently, however, the researches of Gaspar Vianna have been published on the treatment of tropical venereal ulcer and the cutaneous leishmaniasis of Brazil, diseases in which the author has obtained very good results through the employment of intravenous injections of antimony tartrate.

As we were convinced that the parasite causing cutaneous leishmaniasis of Brazil would prove to be identical or at least closely related to the parasite of infantile leishmaniasis, during last August we made a series of trials on the use of the antimony tartrate in the treatment of infantile leishmaniasis. The results so far obtained are so encouraging as to justify this short communication. The method we have adopted is the following:—

Intravenous injection on alternate days of a 1 per cent. watery solution of antimony tartrate, commencing with a minimal dose of 2 cg. and increasing to a maximum dose of 10 cg. The vein selected by us is the one at the bend of the elbow or the external jugular or temporal vein. A thin needle has always been employed so as to avoid extravasations of blood and to enable the same vein to be used repeatedly. It is not possible to administer the drug subcutaneously or intramuscularly, as it easily produces necrosis of the tissues with which it comes in contact. It is not advisable to begin with the maximum dose as there may follow severe symptoms of antimony poisoning and renal trouble.

Up to the present we have treated ten cases. Two of these came under our observation in the final stage of the disease, and can hardly be taken into account as they died at the commencement of the treatment before its effect could be estimated. Of the remaining eight cases five are cured and two are progressing favourably, while one died of acute nephritis, when the symptoms of the disease were just beginning to manifest themselves. It is im-

[1] Translated from *Bull. Soc. Path. Exot.*, February 1915, viii, No. 2, pp. 63-66.

possible to state whether the nephritis in this case was due to the injections of antimony tartrate or to some other cause. Even if it be admitted that this drug was the cause of the nephritis one must conclude that there was a special susceptibility in this case, for reference to the table below will show that less of the drug was administered than in the other cases which recovered.

The two cases which are progressing towards recovery have been treated only for a short time, yet the gradual reduction in the size of the spleen, the diminution of the number of parasites, and the progressive improvement of the blood certainly indicate recovery.

The five cured cases have all been in children with a severe form of the disease. In these the duration of treatment was from fifteen to forty days, and the amount of emetic injected varied from a minimum of 25 cg. to a maximum of 84 cg. Cure was established in these cases by directing attention to improvement in the general condition, disappearance of the pallor, and the enlargement of the spleen, re-establishment of the normal blood formula, and the disappearance of the parasites from the spleen juice.

The following is a tabular statement of the results obtained:—

No. of case	Age	Duration of disease	Duration of treatment	Total amount of drug administered	Result
Case 1	15 months	5 months	20 days	35 cg.	Recovery.
,, 2	6 years	8 ,,	20 ,,	84 ,,	—
,, 3	20 months	4 ,,	13 ,,	25 ,,	Death from nephritis.
,, 4	2 years	5 ,,	40 ,,	40 ,,	Recovery.
,, 5	2 ,,	3 ,,	20 ,,	25 ,,	—
,, 6	1 year	2 ,,	40 ,,	35 ,,	—
,, 7	20 months	3 ,,	20 ,,	26 ,,	Progressing towards recovery.
,, 8	17 ,,	5 ,,	10 ,,	6 ,,	—

We intend to give eventually after continued experiments further statistics; still, one seems justified in concluding from these few results that the treatment undertaken by us has demonstrated an efficient means of treating internal leishmaniasis by the protracted use of antimony tartrate. The general condition and the state of the blood have improved rapidly, with the final result that one has obtained a sterilization of the organism from the parasites of Leishman.

We have not yet determined the mechanism of the action of the drug; it can be stated, however, that after the first injection it is possible to note a change in the cytoplasm of the parasite, which may be interpreted as a lysis. As regards the question of the regeneration of the blood-producing organs during treatment, one prefers to make no statement till more numerous observations have been made.

At present, however, it is our duty to point out to investigators in countries where the disease occurs that in tartar emetic will be found a specific remedy for the therapeutic treatment of internal leishmaniasis.

Correspondence.

QUININE INJECTIONS.

TO THE EDITOR OF "THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE."

SIR,—The discussion which was carried on last year in medical papers on the efficacy of quinine injections in malaria was of very great interest to me, but it took some time to make up my mind about the matter.

The discussion was started, I think, by the report in the *Lancet* of March 28 of a severe case of malaria treated by injections by Captain Tresidder, I.M.S. This drew a letter from Sir Ronald Ross on April 4, in which he condemned injections in no uncertain terms, quoting Sir David Semple's views about tetanus, and expressing doubt about the rapidity of absorption from muscle and subcutaneous tissue. Captain Tresidder replied, on June 6, to the effect that he believed that Semple's work went to prove that quinine was well absorbed after injection, though somewhat more slowly than when given by the mouth. He also pointed out that the dose of quinine given by Semple to his guinea-pigs was, weight for weight compared with man, excessive, and therefore enormously increased the likelihood of washed tetanus spores injected at some other site giving rise to tetanus. He also quoted Sir Patrick Manson's saying about "a dirty needle" and a "fouled solution."

On March 16, an article in THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE condemned the injection of quinine as a practice "which never had anything to recommend it." Ross, Semple, and MacGilchrist were quoted in support of the anti-injection school. To your article replied Dr. Tertius Clarke, of Perak South (September 1), in a very practical letter, which interested me very greatly, for it stated more definitely than I had ever seen before that intramuscular injections of quinine cured when administration by the mouth had failed. Dr. Clarke referred to a meeting of the local medical society which was unanimously in favour of "intramuscular injections." He referred also to tetanus—"many of us think that the danger is so remote as not to be worth considering."

There is, evidently, then a wide gulf fixed between the writer of your article and Sir Ronald Ross on the one side, and Dr. Clarke and his colleagues on the other. On September 15 you crossed most of the way over to Dr. Clarke's side when, discussing his letter, you wrote of the "beneficial effects, wellnigh miraculous, of giving quinine intramuscularly." In the same number Sir Ronald Ross re-stated his opinions and asked for statistics from Dr. Clarke and not *obiter dicta*. He further insisted strongly on the destruction of tissue by injections.

Then in your number of November 2, Captain H. J. McGrigor, R.A.M.C., described a case which he believed proved the efficacy of quinine injections in a patient who had an idiosyncrasy for the drug. Sir Ronald Ross criticized his views in your next issue and described a case of malaria which was not benefited by numerous injections of quinine.

Of other recent papers dealing with this subject, there is one by Bates, of Panama, in your number of October 1, 1913. He writes all through of *hypodermic* injection, and says it is not a method of election, but a method of necessity, one, in fact, to be kept for pernicious cases.

Finally, in the *American Journal of Tropical Diseases and Preventive Medicine* of August, 1914, Dr. Cohen, of Philadelphia, affirms the superiority of intramuscular injections of quinine over oral administration. He gives 15 gr. at a time. He is most emphatic, and says that the intramuscular method is immeasurably superior to the oral, taking the fever-free period after a single dose as a test of relative efficiency (*Tropical Diseases Bulletin*).

Before going further, I must ask you to excuse my temerity in entering into this discussion at all, for the reason that my lines are cast in a country which is not highly malarious—to wit, the Persian plateau. However, there are districts here which are heavily infected, and in the course of a year's work I see some 300 cases of malaria and check them by blood examinations; furthermore, subtertian fever is exceedingly common.

When I first came to Teheran I was greatly astonished by the wholesale use of the syringe as a means of giving many drugs and especially quinine. This I quickly found was due to the preponderating influence here of the French school. Soon it became evident that the syringe in the hands of native practitioners was a most dangerous weapon, for patients constantly presented themselves with painful nodules, necrosed areas, and abscesses in their subcutaneous tissues, the results of "*injections*" (the word has passed into Persian!). Indeed, it not seldom appeared that these unfortunates were suffering more from their injections than from their illnesses. I remember the case of a small girl whose gluteal fat on both sides had completely sloughed away as a result of a series of injections of quinine. My Smithfield training seemed to me, therefore, to be more superior than ever, and I inveighed against injections and proclaimed the advantages of the oral administrations of quinine, whether in solution or in freshly made pills. Soon, however, I met cases of malaria in which vomiting or coma put the taking of quinine by the mouth out of the question. Then I learned the great value of quinine injections—injections made into muscles and not into the subcutaneous tissues. They quickly cut short the fever, they were practically painless, and they never caused abscess or necrosis. I have no statistics to offer Sir Ronald Ross, but my clinical experience has convinced me that intramuscular injections of quinine are quickly efficacious. I have had the opportunity, I am sorry to say, of proving this in my own person. I have never seen tetanus follow an injection made by myself or anyone else, though it must be owned that tetanus is not common in the Teheran district.

Like Dr. Bates, I use quinine injections as a method of necessity for the class of case mentioned above. Being quite satisfied with oral administration in the very great majority of cases of malaria, I am glad to avoid the trouble which an injection of the drug demands.

I have no experience of intravenous injections of quinine. I have not found rectal injections very useful.

European medical men should, I think, in countries such as Persia, where the practice of medicine is not properly regulated, discourage with all their might the use of the hypodermic syringe except where it is absolutely necessary. When carelessly or ignorantly made, quinine injections may cause much harm.

My own practice as regards quinine injections is as follows: They are reserved for cases of malaria complicated by severe indigestion, vomiting, diarrhœa, dysentery, or coma, and oral administration is begun as soon as circumstances permit. The salt used is always the bi-hydrochloride. If the trouble of making an injection is undertaken I always feel that one might as well inject a big dose as a little one, and I therefore seldom give less than 2 grm. to an adult. This (and especially if the injection is repeated or oral administration can be begun) has the further advantage of quickly introducing into the blood a large quantity of quinine at a moment when the parasites are unsophisticated (from the quinine point of view). I generally make my own solution, and that a dilute one; 2 grm. of quinine are dissolved in 10 c.c. of filtered water, for instance. The solution is brought to the boiling point three times while the other preparations are being made. It is injected while still warm. The skin is sterilized with tincture of iodine. A 10 c.c. syringe is used and the needle, after washing off in the sterilizer water any quinine solution which may be on its outside, is plunged vertically to the surface into a muscle. The vertebral muscles in the dorsal region, the gluteal muscles an inch or two below the middle of the iliac crest, and the abductor muscles on the outside of the thigh, are the best sites. The puncture is sealed with gauze and collodion.

To sum up my humble experience—intra-muscular injections of quinine given in the right way are efficacious, quickly efficacious, and harmless; but they must be given in the right way. That they should be used as a routine measure I am not at all convinced, although I am ready to concede that a course of quinine might very well begin with two injections of large doses. Granted that it is advisable to saturate a patient with quinine as early and as quickly as possible in his attack, the injection of quinine is the only possible method of administering the drug in certain diseases.

I am, yours faithfully,
A. R. NELIGAN,
M.D.Lond., D.T.M.&H.Cantab.

Teheran, March, 1915.

Original Communications.

ANIMAL INOCULATIONS OF *TRICHOPHYTON DISCOIDES* SABOURAUD 1909.

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AND

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Introductory.—The authors of the paper entitled "Tinea Capitis Tropicalis caused by *Trichophyton discoides* Sabouraud 1909" being unable to perform animal inoculations with this fungus, we bring forward the following remarks to remedy this defect and at the same time to mention some other interesting points which were omitted in the previous article.

The present communication is the fourth of the series of papers upon "Tinea Capitis Tropicalis" in the Anglo-Egyptian Sudan.

Historical.—Animal inoculations do not appear to have been much studied with regard to *T. discoides*, as the only record which we can find is the successful inoculation of a guinea-pig by Sabouraud.

Whether Bang performed any experiments or not we are unable to say, as we have never seen his complete paper, and the résumé before us does not mention that any were carried out.

We are therefore of the opinion that some experiments should be of interest from an epidemiological point of view, because they might demonstrate the probable animal source from which the human infections arise.

Sabouraud believes that all the faviform trichophytic infections of man come from "bovines," but we believe that *T. discoides* is probably an exception, and our reasons for this are as follows:—

Firstly, Sabouraud shows that one out of his two cases was in contact with cattle which, however, were not known to be infected, while the second could not be associated with these animals, so that the source of the ringworm in this instance was unknown.

Secondly, Bang's cases appear to have been infected from a horse.

Thirdly, Bodin, in 1896, described an epidemic affecting thirty-eight of the forty horses in a stable at Clichy-Levallois, and spreading from these animals to five (not nine, as often stated) persons associated with them, viz., one veterinary surgeon, one farrier, two grooms, and one other person engaged in the stable.

The whole epidemic started by the introduction of an infected horse from Denmark, which is exceedingly interesting, as Bang's epidemic, starting from a horse, also occurred in the same country, while Sabouraud, living in Paris, saw only two persons infected with *T. discoides* in all his great experience of ringworms, and even in these cases he was unable to trace out the source of infection. These facts indicate that Denmark, and not Paris, is the home of the infection as far as is known at present.

Bodin never named the parasite which he found in the epidemic mentioned above, and it is not quite certain what its species may be, but there are some points which raise a suspicion in our minds that it may possibly have been *T. discoides*, and they are:—

(*a*) The infected horse came from Denmark, a country in which Bang's researches have proved *T discoides* to exist and to cause disease in horses and men.

(*b*) Bodin's description of the cultures of the fungus of his epidemic can be applied to some of our cultures here. He says:—

> "L'aspect en cultures de l'espèce trichophytique que je rencontrai dans l'épidémie équine de Clichy-Levallois est absolument caractéristique. C'est lui qui m'a conduit à désigner cette espèce trichophytique sous le nom de *Trichophyton faviforme, à cultures brunes, saillantes et irrégulières.*"

If this description is compared with fig. 1 on the plate illustrating the present paper it will be observed that the two agree. The only points of explanation required are that the colour of our growth was distinctly browner than is usual in cultures of *T. discoides*, while the cerebriform appearance so characteristic of faviform growths is also not very common in our cultures, as they more usually produce forms depicted in fig. 2 until they are very old.

(*c*) Our inoculation experiments, presently to be described, appear also to support the view that Bodin's parasite may have been *T. discoides*.

The interest attaching to this point is that Bodin's cases were infected from the horses, and he believed that one horse was infected from another either by actual contact in the stable or by the harness, while Bang's cases came from a horse, and we suspect that our case probably came from an equine, most likely a donkey. We will, however, refer to this matter later after detailing our experiments.

Animal Inoculations.—Chalmers and Marshall, in their paper on *T. discoides*, under the heading "Zoological Distribution," remark:—

> "*T. discoides* has been known to occur in men and horses. Our case may have been infected from cattle or donkeys. One of Sabouraud's cases probably came from cattle, and Bang's cases from a horse."

In order to test whether the infection came from cattle or donkeys we obtained a bull and a donkey, and shaving three small places inoculated two of these on each animal with *T. discoides* obtained from a subculture after many generations of life in artificial media and having the characteristics seen in fig. 2.

The donkey's back thirteen days after inoculation is seen in fig. 3, and it may be stated that both animals were inoculated on the same day, from the same culture, and lived within a few feet of one another. The inoculation was performed with the three-pronged end of the usual "aseptic vaccination scraper," and was so gently made that no blood or serum exuded.

Briefly stated, the bull has shown no infection up to the time of writing, while the donkey developed

lesions on both inoculated regions on the eleventh day after the inoculation, though the control third area remained quite normal.

Unfortunately the donkey developed pneumonia, from which it died rather quickly on the fifteenth day after the experimental inoculation of the fungus, but by that time the inoculated areas had become swollen and covered with white scales (fig. 4). From these areas we were able, by means of scrapings, to obtain the fungus in pure growth, as shown in figs. 5, 6 and 7, the latter of which may, with advantage, be compared with fig. 2. On microscopic examination a few hyphæ and spores could be found situate among the scales. Funds were not available to purchase another donkey and therefore no further experiments could be made on this species of animal.

An inoculation into the scalp of a monkey, *Erythrocebus pyrrhonotus* (Hemprich and Ehrenberg 1838), was unsuccessful.

Conclusions.—The fact that the bull remained free from infection twenty-five days after inoculation, whereas the donkey began to show signs of the ringworm on the eleventh day after the infection, which steadily progressed to the day of his death from pneumonia, together with the fact that the fungus could be recovered in pure culture, shows that it was more susceptible than the bull, as the two experiments were carried out as nearly as possible under similar conditions.

This experiment tends to show that the infection of the Egyptian soldier probably came from a donkey, as he had been working with these animals in the Zagazig district of the Delta of the Nile, where he became infected.

It also tends to support the view that *T. discoides* is a parasite of equines, and that it is from these animals that man acquires his infection; and in this conclusion we are supported by Bang's observations, and also by Bodin's, if they really are concerned with *T. discoides*, as indeed appears to us to be probable.

From information received, it appears to us to be probable that many cases of this disorder may be found in the Delta of the Nile if looked for.

Treatment.—With regard to the treatment of *T. discoides* as seen in man, we believe that tobacco soap is an excellent remedy, and we were much surprised in finding that Monardes, on folio 43 of the English edition of his work entitled "Joyfull Newes out of the New-found World," published in 1596, extols tobacco as a cure for ringworm.

Khartoum,
March 1, 1915.

ILLUSTRATIONS.

Most of these illustrations may, with advantage, be examined by means of a lens.

FIG. 1, *Trichophyton discoides.*—Human origin, old growth on Sabouraud's maltose agar at 23° C. for ninety-eight days, which is the equivalent of a very much longer period in Europe. It shows the typical faviform characters which only appear in old cultures in *T. discoides.* It also closely agrees with the description given by Bodin of the appearance of the cultures obtained while studying the epidemic of Clichy-Levallois. *Photograph.*

FIG. 2, *Trichophyton discoides.*—Human origin, growth on Sabouraud's maltose agar at 25° C. for thirteen days, showing typical appearance. Note the moist aspect of the culture, which is characteristic, but is usually obtainable in this dry climate only in "capped" tubes. This growth resembles the culture used for the inoculations of the bull and the donkey. *Photograph.*

FIG. 3, *Donkey.*—Back, showing the three shaven areas, two of which were inoculated, while the third was not. The inoculated areas show the infection. *Photograph.*

FIG. 4, *Donkey.*—One of the inoculated areas showing the effects of the infection after thirteen days. *Photograph.*

FIG. 5, *Trichophyton discoides.*—Equine origin; growth on Sabouraud's maltose agar at 25° C. for eight days and obtained from scrapings of the inoculated area shown in fig. 4. This is a primary culture from the infected animal, and not a subculture, hence its rapidity of growth is less than that obtained after repeated subculturing.

FIG. 6, *Trichophyton discoides.*—Equine origin; same culture as fig. 5, but after ten days' growth. It may be compared with fig. 2, which, of course, is older and is also obtained after many subcultures have been grown. It may also be compared with II, Plate XXIV, in Sabouraud's "Les Teignes." *Photograph.*

FIG. 7, *Trichophyton discoides.*—Equine origin; same culture as figs. 5 and 6, only twelve days old. It should be compared with fig. 2, remembering the differing conditions, and with Sabouraud's illustration II, Plate XXIV, in his "Les Teignes." *Photograph.*

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DIFFERENTIAL DIAGNOSIS OF VERRUGA PERUVIANA.

[FIFTH REPORT.]

From the Harvard School of Tropical Medicine, Boston.

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AND

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Differentiation from Frambœsia.—It has been suggested that verruga peruviana is but a form of frambœsia. Thus Eder[1] inclines to the opinion that the two diseases, yaws and verruga, are nearly related, verruga being nothing more than a severe form of frambœsia or yaws, modified partly by the high altitude of the regions where it occurs, and partly by being complicated with malaria. Biffi,[2]

[1] Eder, JOURNAL OF TROPICAL MEDICINE AND HYGIENE, London, 1906, ix, p. 213.

[2] Biffi, *Arch. f. Schiffs- u. Tropenhyg.*, Leipz., 1908, xii, p. 1.

Fig. 1.

Fig. 4.

Fig. 2.

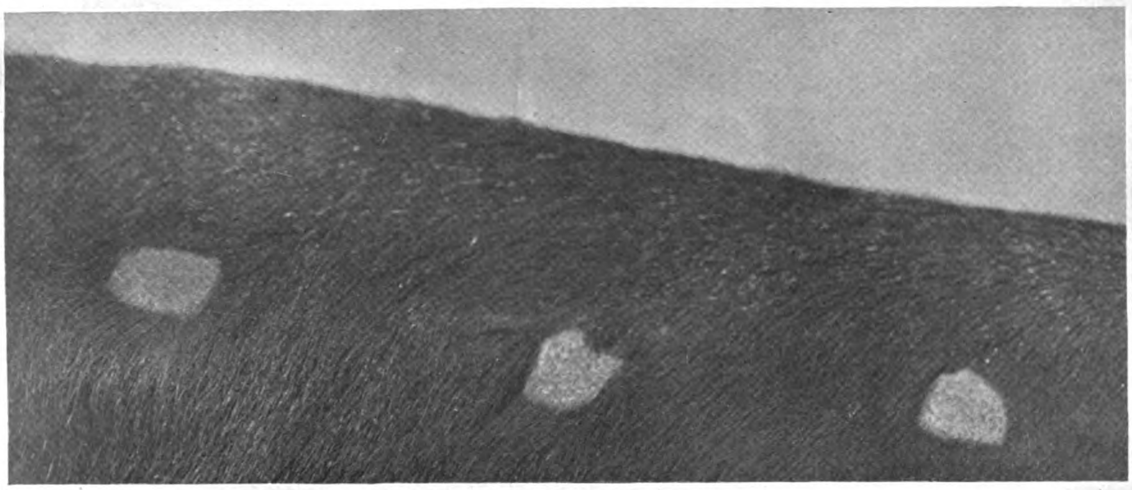

Fig. 3.

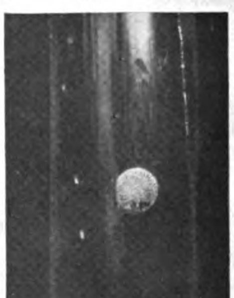

Fig. 5.

Fig. 6.

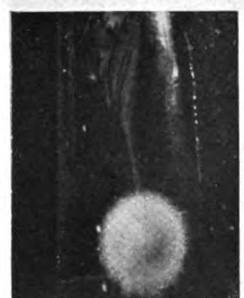

Fig. 7.

To illustrate paper, "Animal Inoculations of *Trichophyton discoides* Sabouraud 1909," by ALBERT J. CHALMERS, M D., F.R.C.S., D.P.H., *Director, Wellcome Tropical Research Laboratories*, and NORMAN MACDONALD, *Junior Bacteriological Laboratory Assistant, Wellcome Tropical Research Laboratories*, Khartoum.

however, who has observed verruga peruviana in Peru, is entirely opposed to this view. In our opinion, anyone who has had a wide experience with either disease would not confuse, from a clinical standpoint, the one with the other. Only in the distribution of the lesions sometimes, and in the fact that in both small nodular tumours appear upon the skin, is there any resemblance in the two diseases. From the descriptions of the lesions already given in previous papers this fact is evident. The most characteristic feature of the yaws lesion is that the primary one is a papule which after about a week becomes moist, developing a yellowish secretion which dries into a crust. The subsequent lesions are also commonly crusted. The verruga lesion has an entirely different appearance. It is practically never crusted, as we have seen from the descriptions already given. Indeed, the most characteristic feature in its appearance is that the skin is smooth, tense, and translucent over it, and that the superior surface of the lesion resembles very much a cherry at the height of the disease.

Other points of differentiation between the two diseases which have been referred to are that frambœsia is contagious, verruga is not. In frambœsia there is generally a distinguishable point where the initial lesion developed. In verruga this is not so apparent. However, as we have demonstrated, there are other more decisive points of difference. Thus from an etiological and pathological standpoint the two are entirely distinct infections. In a very careful study of the lesions of verruga peruviana, as has been emphasized in our experiments discussed in previous papers, we have been unable to detect *Spirochæta pertenuis* or any other visible micro-organism. In the very numerous experiments in which fresh material from the human verruga lesions has been injected into the rabbit's testicle, the lesions produced have not resembled those which result from the inoculation of material from the lesions of frambœsia cases, and again no spirochætæ have been found in them. In the intratesticular lesion which results from the inoculation of frambœsia material, as was first shown by Nichols,[3] spirochætæ are abundant. Finally, the disease verruga peruviana is not cured by injections of salvarsan, as was first shown by one of us (Strong),[4] in August, 1910, to be invariably the case with frambœsia. The lesions of the skin of verruga peruviana seem to be entirely uninfluenced by injections of this substance, while in frambœsia they disappear very rapidly following its injection.

It is not deemed necessary to consider here in detail the differentiation between the histological structure of the lesions of verruga and those of frambœsia. In frambœsia the lesions affect the epithelium rather than the cutis. The surface epithelium is greatly increased and the epithelial cells are degenerated and swollen. In verruga the most striking feature is the extensive endothelial proliferation occurring about newly formed blood-vessels, a condition which is not observed in frambœsia. The histological appearances of the verruga lesions have been thoroughly considered in our previous papers, and from this description it is evident that from a pathological standpoint, as well as from a clinical one, the two diseases are also distinguishable.

While discussing the differentiation of verruga peruviana from frambœsia, it may be advisable briefly to refer to its differentiation from syphilis. From what has already been said regarding the absence of spirochætæ in not only the human lesions of verruga, but particularly in those produced in the rabbit's testis with verruga material, and from the complete resistance of the disease to treatment with salvarsan, it would appear evident that the disease is not a form of syphilis. The Wassermann reaction was negative with one exception in the cases of verruga which we studied. In performing these experiments cases of syphilis were used as positive controls, and normal cases for negative controls. In nine cases of verruga in which a well-marked eruption was present the reaction of the serum was also investigated in relation to the fixation of complement with a specific antigen prepared from a verruga nodule. In none of these cases was a fixation of complement obtained. It is noteworthy in this connection that according to Castellani[5] and Bowman[6] fixation of complement occurs with the serum of yaws cases when yaws antigen is employed. Baermann[7] found that in yaws as in syphilis the Wassermann reaction is present.

In the study of the blood in verruga peruviana, it was found that an extract prepared from a cutaneous nodule from a case of verruga showed the presence of a hæmolysin, which was active in dilutions of 1 in 1,000.

Differentiation from Oroya Fever.—From the descriptions given in our previous publications regarding Oroya fever and verruga peruviana, and from the experiments detailed in these papers it would seem evident that Oroya fever and verruga peruviana are two distinct diseases. We believe that we have conclusively shown in these pages, first, that verruga peruviana is due to a virus which may be transmitted to several of the lower animals, particularly monkeys, in which animals characteristic lesions are developed[8]; second, that Oroya fever is due to a micro-organism (*Bartonella bacilliformis*) which is a parasite of the red blood corpuscles and of the endothelial cells. Up to the present time it has not been transmitted to animals. In man in severe infections this parasite gives rise to a rapid and pernicious anæmia, which often results fatally. Verruga peruviana is very rarely a fatal

[3] Nichols, *Journ. Exper. Med.*, Lancaster, Pa., 1910, xii, p. 616.

[4] Strong, *Philippine Journ. Sci.*, Manila, 1910, v, Section B, p. 433.

[5] Castellani, *Journ. Hyg.*, Camb., 1907, vii, p. 566.

[6] Bowman, *Philippine Journ. Sci.*, Manila, 1910, v, p. 485.

[7] Baermann, *Münch. med. Woch.*, 1910, No. 41.

[8] **The characteristics of this virus have been described in previous papers.**

disease, and there is no marked anæmia accompanying it. Its most characteristic feature is the occurrence of the eruption upon the skin. When fresh material from the lesions of verruga are inoculated intravenously and cutaneously into monkeys, the parasite of Oroya fever does not appear in the blood of these animals. The pathology of the two diseases is also quite distinct, as is evident from the facts set forth regarding this question in previous papers.

Bartonella bacilliformis is not found in the blood of uncomplicated cases of verruga peruviana, but occasionally concomitant infections of Oroya fever and of verruga are encountered just as concomitant infections with verruga and malaria are frequently observed. This fact has also been more fully discussed in previous papers. In spite of the evidence which we had adduced of the specificity of the two diseases, many Peruvian physicians insisted upon their unity and pointed out that in Carrion's experiment the inoculation was made with blood from a verruga nodule, and that he died of Oroya fever. On account of the insufficient data regarding this experiment, the condition present at the autopsy, and the examination of the blood, it is impossible to say to-day of what infection Carrion died. Certainly there is no definite proof that he died of Oroya fever. Nevertheless, it seemed advisable to repeat the experiment of Carrion. Having become convinced from clinical observation and experimental evidence that Oroya fever and verruga peruviana were two entirely distinct diseases, and having secured through the kind assistance of Dr. Matto, Professor of Bacteriology in the University of Lima, a volunteer (a Chilian), a direct inoculation was made from two cases of verruga peruviana. A portion of a skin lesion from each of the two patients with verruga was removed, and within twenty minutes of the time of this operation the skin of the normal person over the left shoulder was thoroughly scarified, and a portion of the nodules removed from the verruga patients thoroughly rubbed into the scratches. The vaccination scratches were healed entirely at the end of about ten days, and the skin appeared normal. On the sixteenth day two small groups of cherry-red papules at the end of some of the vaccination scratches appeared, and a few days later another small group became visible. At this time the note made regarding the experiment states: "To-day the papules measure from 1 to 2 mm. in diameter; they are situated in three clusters, at the ends of the vaccination scratches. The scratches have all healed and the skin appears otherwise normal. The papules are of a bright red colour, raised above the surface of the skin, and sharply circumscribed. The skin covering them is tense and translucent." These papules increased slowly in size until the thirty-fifth day, when two of the groups were removed. The blood examination of the vaccinated person never revealed the parasite observed in the blood of Oroya fever cases, and no appreciable anæmia developed. The red blood corpuscles numbered 4,300,000 per cubic millimetre at the time of the inoculation, and at the time of the appearance of the eruption they were 4,500,000. On the day the papules were removed the red count was 4,216,000. The leucocytes numbered 10,000 on the day the papules were first observed; after a week the count showed 8,000. There was but a slight febrile reaction preceding the eruption. The symptoms preceding the eruption were mild, the patient stated that he felt languid, and the facial expression gave the appearance of his being tired and depressed. No generalized eruption upon the skin occurred, and the individual was in good health at the time of our departure from Lima. A portion of the lesions removed from the case were placed in Zenker's solution for section, and another portion ground and suspended in saline solution, and inoculated into the testis of rabbit No. 73. The section of the lesions showed distinct papular formation and a similar histological structure to that observed in other early human lesions of the disease. The rabbit developed a typical verruga lesion in the testis after twenty-five days. From this experiment it appears evident that the direct inoculation of the verruga virus from man to man does not produce Oroya fever, but a modified form of verruga eruption, just as the inoculation of small-pox virus from man to man produces a modified form of small-pox eruption. From this experiment it would also appear that the last objection to the idea that verruga peruviana and Oroya fever are two distinct diseases as based upon Carrion's experiment has been removed.

Relationship to Paratyphoid Fever.—It has been suggested that Oroya fever is paratyphoid to which yaws is superadded. This statement, it appears to us, requires no further discussion here. We have already referred to the fact in previous papers that paratyphoid fever has often been diagnosed in Peru under the name of Carrion's fever, and sometimes as Oroya fever. Of the twenty-four cases of verruga peruviana which we studied, none of them were complicated with paratyphoid infection. Of course, there is always a possibility that a concomitant infection with these two diseases might occur. During the time our investigations in Lima were being made we observed a case of fever without any eruption which was shown to us as Oroya fever. We found no micro-organisms in the red blood corpuscles of this patient. Subsequently we were able to show by bacteriological examination that the case was one of paratyphoid infection, and not one of Oroya fever. From the discussion given in this section of the report it seems evident that verruga peruviana is a distinct disease *sui generis*.

Relationship to Angiofibroma Cutis Circumscriptum.—Bassewitz[9] has described in Brazil, under the name of "angiofibroma cutis circumscriptum contagiosum," a disease which from the description given evidently bears considerable resemblance to verruga peruviana. Bassewitz states that from the appearance of the lesions upon the skin alone a

[9] Bassewitz, *Arch. f. Schiffs- u. Tropenhyg.*, Leipz., 1906, x, p. 201.

differential diagnosis of the two is difficult. No spirochætæ were found in the lesions. He believes, however, that angiofibroma is a different disease from verruga, basing his views upon the descriptions given in the literature regarding the symptoms of verruga peruviana. He calls attention to the fact that there is not the same high mortality in angiofibroma contagiosum, that the eruption is not preceded by high fever, anæmia, and prostration, and that symptoms due to the development of the lesions internally also do not occur. Rocha-Lima,[10] in a more recent publication, gives these same views as his own, although he has never apparently had an opportunity of examining the fresh blood in the case of Oroya fever, and has studied but one case of verruga peruviana. As we have called attention to above, these symptoms do not occur in uncomplicated verruga peruviana, and the mortality of the disease is not high. From a histological as well as a clinical standpoint it appears that the two conditions, if not identical, are probably very closely related. The histology of both has been considered in previous papers and need not be referred to here. Further information, however, is desirable before verruga peruviana and angiofibroma cutis circumscriptum contagiosum can definitely be regarded as one and the same disease.

GENERAL NOTES.

CHINESE CONSERVANCY ENGINEERING COLLEGE.—A college has been founded at Nanking for the study of conservancy engineering. It is under the control of the National Conservancy Bureau, and its expenses are paid by the provinces of Chihli, Shantung, Kiangsu, and Chehkiang. The whole course covers four years—one year in the preparatory school and three years in the college. For the purpose of meeting requirements for the conservancy work of the Huai River a special course is given. This course covers two years of the study of important subjects. The requirements for entrance examination are Chinese essay, English, algebra, plane and solid geometry, chemistry, and physics.

GROUND-NUTS.—At the Imperial Institute attempts are being made to create a market in this country for the ground-nuts grown in India and the British Colonies, such as Gambia and Nigeria. As a food for cattle, the value of the ground-nut has long been recognized, but in the United States of America the nuts are eaten roasted as well as in the form of "pea-nut butter," a paste made by grinding the blanched kernels. In West Africa the kernels are used as a vegetable, chiefly in the form of soup, though they are also served in a variety of other ways. In France a good deal of what is sold as olive oil is really derived from ground-nuts.

[10] Rocha-Lima, *Verhandl. d. deutsch. path. Gesellsch.*, Jena, März-April, 1913, p. 409.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 1, 1915.

LOW FEVER.

THE very mention of this condition is sufficient to cause the reader to turn over the leaf and go on to something more interesting and tangible. The mention of low fever by a patient raises in the doctor's mind a vista of complaints by patients for which he has either no place in his nomenclature or views the patient's statement askance.

The patient persists in his or her statement, and,

smile as the doctor may, there is the patient with the temperature above the normal the whole or the greater part of the twenty-four hours. The pyrexia continues for weeks or months—it may be as long as six months—at a stretch, and all the doctor's skill and drugs fail to budge the symptoms. No one has tackled the subject of low fever, at any rate with any known measure of success, nor has anyone even suggested a cause beyond the fact that he believes it is due to some form of malaria. What this form may be has never transpired, and it is doubtful if it ever will, for no one has ever shown that malaria has anything to do with the slight pyrexia on which the name low fever is bestowed. There is no doubt that some people—the public, that is—think low fever means a temperature below the normal, and their belief is entertained by finding that their own early morning temperature is down to 97°, or even 96·5° F. That, however, is not the meaning of the "low fever" of the majority of people. Low fever may be described (not defined) as a condition in which pyrexia prevails for the whole or the greater part of the twenty-four hours, the thermometer registering between, say, 99° and 100·5° F., or a little higher, persistently.

The believer that the elevation is due to malaria gives quinine, only to be disappointed; on the other hand, another observer will search the alimentary canal from decayed teeth to a microscopic examination of the stools in his belief that the feverish state is due to a toxæmia, and follow up his convictions by administering vaccines or serums of sorts, again to be foiled in the attempt to cure. Some blame alcohol producing a chronic irritation of the liver, which is discovered to be somewhat enlarged, sharp-edged, and tender, and these observers go so far as to suspect that the patient, who denies taking alcohol, is a secret drinker, and that whisky and soda is the cause. Who amongst us has not been worried and bothered in practice with patients declaring that their temperature is always a little above the normal? But other patients say they take no notice, that they have observed it for a long time, and that nothing they take makes any difference.

Is "low fever" a specific ailment? It does not come under the term "chronic fever," that means usually to most people a series of continual relapses. When residents from the Tropics are asked if they have had malaria, 50 per cent. of them say "No, I never had malaria;" if asked "Have you had any fever?" "Oh, only a low fever at times, but I never had malaria." We (doctors) smile and write down malaria in our note-books, and consider the patient makes these statements in profound ignorance.

It is surely time these persistent pyrexias exhibiting the low degree of temperature mentioned were taken in hand scientifically. We seem to rest content that it is a condition due to residence in the Tropics, and therefore in a feverish, that is, a malarial district. The low fever may exist in a feverish district and yet have nothing to do with malaria; and so far as treatment is concerned, at least treatment for malaria has no effect on the condition.

Is it, then, a specific ailment? If so, we look for a germ infection, but so far none has been found. There is a peculiar absence of parasites met with in the blood of those who have low fever; peculiar, inasmuch as most people living in a malarial area have these parasites in the blood, and yet do not complain of fever or illness at all.

Is it climatic? Some there be who will not hear a word against a tropical climate, apart from germ or parasitic infection, and declare that it is these germs alone which cause disease or even altered physiological conditions.

For one to suggest that the climate is unhealthy, apart from infection, is regarded as due to ignorance; and few of us dare to lift our voices in case we be put down as unscientific—a calamitous epithet to be heaped upon the doctor of to-day. It is well, however, to have doubters amongst us; by doubting statements which seem established is always an unpopular part to play, and few there be who care to draw upon themselves the stigma of having done so. To mention, for instance, that the malaria parasite may be found outside man or the mosquito in, say, the swamp water in which the mosquito breeds is considered a heterodoxy which few dare to acclaim, and the man who publishes drawings of organisms derived from swamp water, which resemble in any way the malaria parasite, gets short shrift amongst modern observers.

Those of our readers who have from time to time read the valuable and remarkable papers published by Dr. Mathew D. O'Connell in the columns of this Journal would do well to study his observations more closely than they have hitherto done. So far no other man is known to be working at the subject of temperature and moisture in relation to a febrile state than Dr. O'Connell. Certainly no one in this Journal has even discussed the matter, and his careful and elaborate observations have, so far as we can make out, gone unnoticed. This neglect of temperature and moisture in relation to pyrexia cannot go on, unless we are to stifle facts for some purpose which is not clear. Are we so warped in prejudice that the tropical climate is only unhealthy from germ infection; are we so satisfied with the part played by malaria that we are to shut our eyes to other factors? Yet surely if ever a subject has been scientifically dealt with it is that discussed by Dr. O'Connell. In Lancashire weaving sheds, in which certain cotton goods can be manufactured only under certain atmospheres, that the people working in these atmospheres suffer from "low fever," is a statement which has to be proved incorrect if we are prepared to stick to the belief that climate has nothing to do with pyrexia, and that a tropical climate (moist and hot) is not prejudicial to health except through the baneful effects of infective germs.

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Annotations.

Chemistry of Rice Polishings.—Fraser and Stanton (*Lancet*, May 15) do not object to the word "vitamine," but have not been able to extract it from rice polishings, due in part at least and perhaps entirely to the use of baryta.

Liver Abscess with Heart Disease (Pascale, *Gazzetta degli Ospedali e delle Cliniche*, March 14). —The abscess developed in the course of catarrhal enteritis. Cyanosis and dyspnœa indicated failure of a previously compensated heart, which precluding an operation was rapidly fatal.

To Sterilize Instruments and keep them ready for Use (Gerson *Med. Klin.*, February 21, 1915).—They are wiped with cotton-wool dipped in tincture of soap and then with fresh cotton. Each blade is then wrapped separately in fresh cotton dipped in the tincture of soap, and the instrument is laid away for use at once or after an interval of several weeks.

Mycotic Infection of Wounds in War.—Rouyer (*Bull. de l'Académié de Med.*, March 2) has encountered a number of cases of actual mycosis of the tissues after a shell wound. Ordinary antiseptics had no influence and healing was delayed until tincture of iodine was replaced by formaldehyde or a stick of copper sulphate with which he cauterized the edges of the wound. In one case the fungus was identified as the *Saccharomyces tumefaciens.*

Pleurisy in Syphilitics (Vasoin, *Gazzetta degli Ospedali e delle Cliniche*, March 11).—Tuberculous pleurisy is frequent in syphilitics, but there is no evidence of exclusively syphilitic pleurisy. There is no record of a positive Wassermann in the pleural effusion, with a negative in the blood. Syphilis may be suspected when specific symptoms appear in the skin and pleurisy develops without previous symptoms of tuberculosis.

Pupillary Reaction (Sarbó, *Neurol. Zentralbl.*, 1914).—The patient, not quiet facing the light, raises the eyes towards the ceiling, tightly closes the lids, after a few seconds opens them to look at a distant object. Normally the pupils first contract, then relax. Barely perceptible initial contraction, with almost immediate relaxation, indicate sluggish reaction.

Palpating a Kidney (Pope, *Kentucky Med. Journal*, 1915).—The patient stands in front of the examiner, who sits and places one hand or fist on the rectus with sufficient pressure to overcome rigidity. The patient then leans forward over the shoulder of the examiner, who, with thumb and fingers of the other hand, grasps the tissues between the abdominal wall and the back and the movability of the kidney is estimated.

Rabbit and Horse Meat.—Schottelius (*Deut. med. Wochenschr.*, January 14, 1915) states the expense of raising rabbits for food is always much greater than to raise a pig to produce the same amount of meat. The horses shot in battle are supplying quantities of good meat. They are killed under conditions similar to those of the chase, and the meat thus provided can be utilized to feed at least the many thousands of prisoners of war, thus sparing other meats for the populace.

Indigestible Food and Chilling of the Abdomen.—A. Schmidt (*Med. Klin.*, February 21). When the bowels are upset chilling of the abdomen exaggerates peristalsis and brings on diarrhœa. Consequently he emphasizes the necessity for wearing an abdominal belt when there is a tendency to diarrhœa. Such persons are generally dyspeptic, with insufficient gastric secretion or excessive motor functioning in stomach and bowel. The healthy should not wear an abdominal belt, as it has no prophylactic action in regard to dyspeptic diarrhœa, and those with sensitive bowels should wear it only while the tendency to diarrhœa persists.

Disturbances in Internal Secretion with Dysentery.—Peiser (*Deut. med. Wochenschr.*, January 14, 1915) reports that dysentery is liable to be accompanied by excessive functioning of the thyroid-suprarenal group, overbalancing the pancreas-parathyroid group. The practical conclusion is that the vagotony thus revealed should be combated with belladonna, and this proved decidedly effectual in his cases, especially when the dysentery was subsiding. In some patients a circular constriction of the small intestine could be palpated, above which the bowel was distended, causing discomfort and pain, all yielding to belladonna. This remedy also cured the pain from hypersecretion in the stomach, rebellious to opiates, in the course of dysentery, and in moderate doses caused the immediate cessation of salivation and gastric distress.

Modern Treatment of Tabes and General Paralysis.—De Smitt (*Nederlandsch Tijdschrift voor Geneeskunde*, February 20) repeatedly examines the cerebrospinal fluid to keep an oversight over conditions so that treatment of syphilis can be suspended or resumed as needed, and in this way the patient is saved from the development later in life of tabes or general paralysis. Even when the latter is present, as revealed by the cerebrospinal fluid, prompt and vigorous treatment may arrest it in its incipiency. He agrees with Wechselmann that it is better not to give mercury during the course of salvarsan. No

influence on the Wassermann from mercurial treatment was evident in the cases cited, but when the mercury was dropped and reliance placed on salvarsan alone the cerebrospinal fluid findings and the Wassermann reaction soon returned to normal. In conclusion he reiterates his belief that the future will see very few cases of tabes and general paralysis if general practitioners appreciate the power in their hands. They are the ones to whom the patients first apply, and the outcome may depend altogether on their diagnosis.

Prophylaxis of Typhoid.—Schmidt (*Deut. med. Wochenschr.*, January 14, 1915) states that the inoculation against typhoid should not render nurses and orderlies careless in regard to protecting themselves against typhoid. Special care must be taken against droplet infection when there is a typhoid angina or bronchitis. The vomit also is often swarming with typhoid bacilli. Certain typhoid patients eliminate unusual amounts of the bacilli in stools and urine while others eliminate very few. He advises a distinctive coloured case card for the former, constantly impressing on the attendants the necessity for specially protecting themselves against these *Massenausscheider*. Waterproof overgarments and aprons and easily sterilized overshoes should be worn while tending them.

Turpentine Exterminates Vermin.—Marschalko (*Deut. med. Wochenschr.*, January 14, 1915) uses purified turpentine oil, oleum terebinthinæ rectificatum, to destroy lice and their eggs. It is best applied in the form of a spray, and destroys all kinds of vermin, even big roaches. The fumes also suffocate lice in time, even when quite diluted. The purified turpentine does not irritate the skin nor stain the clothing, while it evaporates so rapidly that it has no toxic action on man if there is sufficient ventilation. It is also cheap, and is not so inflammable as benzine. The hair is sprayed with it and a flannel cloth dipped in it is tied over the head with a towel. In the morning the head is found free from live vermin, no matter how thick they were the day before. The turpentine spray has been found a satisfactory solution of the body-lice question in the trenches where it has been applied. It can also be used, incorporated to 50 or 65 per cent., in a salve. Even sheepskin can be cleared of vermin with the turpentine spray.

Angina Pectoris.—H. Vaquez (*Archives des Maladies du Cœur*, March-April) describes the history and clinical features and forms of angina pectoris following over-exertion and of the spontaneous type occurring during complete repose. The "exertion" and the "decubitus" types may be superposed, but when the latter occurs alone and there are no organic lesions in the heart or vessels, complete recovery is not exceptional. The trouble is merely a primary dilatation of the left heart when the heart has been "forced." Vaquez incriminates tobacco in the etiology less than others do, regarding it as liable to provoke an attack with hitherto latent organic trouble, but not capable of inducing the latter. Huchard found a history of syphilis in thirty-five of 150 cases of angina pectoris and Vaquez in thirty of 100, and this before the Wassermann reaction was known. The pathologic lesion responsible for angina pectoris seems to be a characteristic aortitis just at the openings into the coronaries. The changes thus causing obstruction in the coronaries are typical of syphilis although they may be due to other causes.

Acute Bacillary Ileocolitis.—P. F. Barbour (*Tennessee State Medical Association Journal*) administers purgatives to a child that is having a stool every hour of mucus more or less blood-stained from the sigmoid and does not represent real fæcal movement from the upper bowel. Whenever true fæces appear in the stool there will be some improvement in the condition of the child. A prescription which has proved helpful is as follows:—

Olei ricini	ʒss-ʒi.
Pulvis acaciæ	q.s.
Syrupi rhei aromatici	℥ss.
Misturæ cretæ	ad ℥i.

M. Sig.: One teaspoonful every two hours until the stools are fæcal, when it is given less frequently.

Mercuric chloride in $\frac{1}{128}$ gr. is given as long as there is blood in the stool, or fever. When convalescence is well established, bismuth with some of the organic tannic acid compounds is continued until the stools are firm. The food should be barley water, alternating with soups, or jelly, or buttermilk. As convalescence is advancing skimmed milk may be added in small quantities to the barley water tentatively. It may be increased with tolerance; at the same time zwieback or rusk gives some variety and zest to the broths. Fat should be withheld for some time, as the digestion of fats is notoriously bad after any severe diarrhœal disorder.

BERIBERI FACTS.

Many cases of beriberi were reported on the German steamer *Kronprinz Wilhelm*, which was recently interned at an American port. Investigation shows that in the dietary of the seamen the bases of lime were distinctly absent; fresh meat, white flour bread, boiled potatoes, butter, lard, and sugar having been the chief articles of diet. On the 255 days which make up the cruise of the vessel, the men subsisted on food containing an excess of acid-forming elements and a deficiency of alkaline ash. The fact is also significant that forty-seven of the sailors suffering from beriberi were dismissed from the ship's hospital within eight days after a change to a diet rich in alkaline ash.

Abstracts.

DIABETES WITHOUT HYPERGLYCÆMIA.[1]

The establishment of this clinical entity is due to the modern investigations of the sugar content of the blood in health and disease. There is no longer any doubt that the renal excretion of sugar in true diabetes mellitus is associated with an unduly high level of circulating sugar in the fluids of the body. The normal sugar content of the blood plasma fluctuates at about 0·1 per cent. glucose. It may temporarily rise to a considerable height, even to nearly 0·2 per cent., without leading to glycosuria. On the other hand, if sugar is found in the urine under conditions which point to no hyperglycæmia, and perhaps even show a normal level in the blood, the indication of a so-called renal diabetes is present. Before the advent of clinical blood-sugar estimations in man, the determination of this form of disease was based largely on the occurrence of sugar in the urine rather unvarying with the carbohydrate intake in the diet. An involvement of the kidney with evidences of nephritis has been regarded as a further essential condition for renal diabetes in man.

That damage to the kidneys can lead to the elimination of sugar is abundantly testified by the modern studies on "kidney poisons," such as salts of uranium, chromium, or mercury. In relation to the transitory glycosurias of pregnancy it is to be recalled that evidences of mild nephritic involvement are commonly present. Therefore, when one meets a mild glycosuria which exhibits sugar variations that bear no obvious quantitative relation to the diet, which rarely exceeds an output of 20 grm. per day even with an abundant ingestion of carbohydrate, and which is present in an individual exhibiting symptoms of neurasthenia or mild albuminuria, the suspicion of a renal diabetes must be aroused. The examination of the blood plasma, particularly during a period of actual glycosuria, completes the data needed for a decision.

It will come as a surprise to many to learn that the renal type here described is not uncommon in the period of adolescence. The importance of recognizing it in a discriminating way is manifold. From the standpoint of treatment, restriction of carbohydrate is not called for. There is no tolerance to be established and no hyperglycæmia to be overcome. The complications of true diabetes in older persons do not occur; for there is no excess of circulating sugar to induce the manifestation of pruritis, furunculosis, cataract, retinitis, &c. This is likewise true of the non-diabetic glycosuria that is seen in pregnancy. If renal diabetes is to be looked on as a relatively harmless anomaly, the question of its status in the hands of life insurance experts remains to be ascertained. Whether or not the significance of these glycosurias without hyperglycæmia is great remains to be seen. We must always become alert when reasonable provocations are presented.

[1] Abstracted from *Journ. Amer. Med. Assoc.*, May 15, 1915.

C. Gram (*Hospitalstidende*, Copenhagen, April 7) describes renal diabetes.—It is analogous to the experimental diabetes induced by phlorizin, and has no graver significance, as the sugar content of the blood is within normal range. His patient is a medical student, aged 25. There were no symptoms and no objective findings except the 1·3 up to 3 per cent. sugar in the urine. On an ordinary diet the total sugar eliminated was 39·2 grm., but on an anti-diabetic diet it dropped to 22 grm. No albumin or acetone was found in the urine at any time, but the strictest anti-diabetic diet never cleared it of sugar. The general condition was excellent, and he completed his medical course with zeal and pleasure. This elimination of sugar in the urine with normal sugar content in the blood should be called renal glycosuria, not renal diabetes. So far as known to date, this condition never runs into actual diabetes later. There seems to be some chronic anomaly in the kidneys, like the condition induced transiently by phlorizin. The only injury, apparently, is that the weight is not quite up to normal. It seems advisable to restrict the sugar in the diet, but otherwise no restrictions need be imposed, and this renal glycosuria need not be regarded as a special risk in life insurance.

LIGHT-STROKE.[1]

Freckles are a familiar indication of a physiologic response to light, since they make their appearance on those parts of the body which are exposed to the sun's rays. Predisposed individuals react with more pronounced cutaneous symptoms under conditions in which sunlight is believed to play a *rôle* as a causative agent. Indeed, the skin is not the only organ which may react.

The sense of distress in a hot sun is not precisely like that provoked by a hot fire. This justifies the question as to whether the sunlight as such may not produce serious pathologic consequences, particularly if the subjects have not become gradually habituated to sun exposure.

The photodynamic action of certain organic substances, to which attention has been called of late, may have a bearing on the problems raised by some of the pathologic effects of light. It has been shown that injection of suitable sensitizing compounds into albino mice renders the animals peculiarly irritable when kept in the light, though they show no untoward effects in the dark. Hæmatoporphyrin, a derivative of the pigment of the red blood corpuscles belonging to the group of investigated photodynamic substances, is of special interest because it is actually known to arise in the animal body under pathologic conditions. The symptoms which the animals treated with hæmatoporphyrin develop in the light are not due to any inherent toxicity of the compound itself. They ordinarily consist of lesions of the skin, accompanied by subcutaneous œdemas and other severe effects. These may assume an acute or a chronic form, and

[1] Abstracted from editorial, *Journ. Amer. Med. Assoc.*, May 15, 1915.

are not infrequently fatal in their experimental outcome. The photosensitizing effect of hæmatoporphyrin on man has been demonstrated. The most recent progress in this field is represented by Hausmann's ability to sensitize animals with porphyrins to such a degree that profound reactions are produced immediately on exposure to light.[1] In his earlier work the cutaneous symptoms usually were the first manifestations of abnormality, disturbances of the central nervous system making their appearance much later, if at all. By Hausmann's new technique it is possible to render animals so responsive to the effects of light that as soon as they are exposed to the rays they promptly enter into a narcosis terminating fatally in a few minutes. By treatment with the light of a quartz lamp, suitably prepared mice manifest the chronic forms of this sensitization. The ultra-violet light is also concerned in the change. Brief treatment with light from a quartz lamp may lead to necrosis.

This intensely acute mode of death by exposure to light has been expressively designated as light-stroke to distinguish it from the manifestations of true heat-stroke. It offers an experimental analogy, perhaps, to the obscure harmful effects of sunlight which still await a rational scientific interpretation.

THE CEREBROSPINAL FLUID IN SURGERY.[2]

By F. Hagler and M. G. Seelig.

Though definite symptoms follow increase of the fluid, as in rapid cerebral compression and injection of antimeningitic serum, none are recognized as due to a decrease. It is secreted by the cubical cells of the choroidal plexuses of the lateral ventricles and by the perivascular lymph spaces; its rate of flow is influenced by the intravenous injection of various substances; but hexamine, sodium salicylate, and bile pigments are the only ones recovered from it. In every three or four hours it is estimated that a total new supply is secreted; the quantity secreted after basal fractures is no criterion of the normal rate of production. Its absorption is hindered and tension increased by obstructing the venous sinuses and changes in the drainage of the subarachnoid space.

The symptoms of meningitis due to pressure are relievable by repeated puncture, though cases are known of suppurative meningitis following spinal injections for anæsthesia, some due to the use of phenol derivatives, especially trikresol, powerful poisons to nerve tissues. Toxic effects of micro-organisms on brain and nerve may prove fatal. Drainage of the cisterna magna, simultaneous tapping of the ventricle and spinal cord with continuous drainage, tapping the ventricles through a trephine opening, laminectomy, though not unpromising, are not yet established methods of treatment.

Brain tumours produce the greater part of compression symptoms by interference with cerebrospinal drainage rather than direct pressure; for its relief, repeated puncture of the corpus callosum to open a direct path from the ventricle to the subarachnoid space has been suggested. The ocular changes are generally considered due to interference with venous return from the eye; pressure is transmitted along the dural sheath of the optic nerve to the lamina cribrosa, causing papillœdema rather than optic neuritis. The analogy between the production and reduction of ocular and cerebrospinal fluids allows glaucoma to be compared with internal hydrocephalus.

THE RECRUDESCENCE OF TYPHUS.[1]

Always the companion of war and misery, known at different times by its old names of camp fever, siege fever, famine fever, and gaol fever, it raged all over Europe during the Napoleonic wars, only to die out in later years so completely as to be almost forgotten. The history of typhus is written in those dark pages of the world's history which tell of the grievous visitations of mankind by war, famine, and misery of every kind. A complete history of typhus would be the history of Europe during the last three and a half centuries. Clemow, in his "Geography of Disease," says that "in the earliest ages of the world's history typhus accompanied famine, sieges, and wars." Yet both civilization and science had practically forgotten it. All authorities of the present generation have described it as a rare disease. Several generations of medical men grew up and died with hardly any knowledge of it. Yet six months of war with its accompanying horrors bring back mankind's old enemy, the companion of famine, rapine, and barbarism in a thousand wars.

This relapse into barbarism, hopeless though it may be, is robbed of at least a part of its horrors, so far as typhus is concerned, by the scientific advances of the last decade. We know to-day what in previous wars was not even suspected, that typhus is transmitted only by the louse, which thrives in times of squalor, congestion, confusion, and despair, and that cleanly habits, frequent bathing and changing of clothing and liberal use of insecticides will prevent its development and spread. This age-long scourge has lost its terrors. Only in those countries which are so hopelessly war-ridden as to make decent living impossible is there any excuse for the presence of this disease. When the present war is over it will again disappear, only to reappear again, as it always has and always will so long as supposedly civilized nations resort to wholesale murder and destruction as a method of settling their difficulties.

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[1] Hausmann, W.: "Ueber die sensibilisierende Wirkung der Porphyrine," *Biochem. Ztschr.*, 1914, lxvii, 809.

[2] Abstracted from the *Interstate Medical Journal*, March, 1915.

[1] Abstracted from editorial, *Journ. Amer. Med. Assoc.*, May 1, 1915.

Reviews.

A Guide to the Use of Tuberculin. By Major A. W. R. Cochrane, I.M.S., and Major C. A. Sprawson, I.M.S. Pages vi + 181. London: John Bale, Sons and Danielsson, Ltd. 1915. Price 5s.

The authors have accomplished their object of indicating, in particular cases, when tuberculin can be administered with advantage, the dosage, and methods to employ. In the Tropics the treatment of tuberculosis has many pitfalls due to the complication of other diseases, enervating climates, and the varying constitution of individuals.

The book commences by indicating the *rôle* of tuberculin and the choice of preparation to be used. Three chapters are devoted to technique, tuberculin reaction, and a working hypothesis of the action of tuberculin. There are also three chapters dealing with the principles of, and the estimation of, the dose. The rest of the book treats of this special means of diagnosis, its value in pulmonary tuberculosis of infants, contra-indications to this treatment, and its use in tuberculosis other than pulmonary.

The book merits considerable praise, a share of which is due to the publishers.

Compendium of the Pharmacopœias. Fifth Edition. By C. J. S. Thompson. Pp. 398. London: John Bale, Sons and Danielsson, Ltd. 5s net.

This work supplies the needs of medical practitioners, pharmacists, and students. It commences with the newer remedies, and a synopsis is then given of the British Pharmacopœia, 1914, followed by the drugs and preparations omitted from the Indian and Colonial Addendum. Then are given the Pharmacopœias of the United States, France, Italy, Russia, Switzerland, Denmark, Spain, Belgium, The Netherlands, Norway, Japan, and "others," followed by useful unofficial formulæ for sprays, lozenges, salvarsan, and anæsthetic preparations, antitoxins and solutions for anæsthesia, dressings, plasters, baths, and food. Tables of the doses of drugs for animals are of the greatest use to veterinary students (horse, ox, sheep, pig, dog) and dispensers of veterinary medicines. A clearly printed index of 38 pages facilitates ready reference. A book that has attained the fifth edition has abandoned the callousness of youth and is still far distant from the verbosity of senility. There is no doubt that repeated revisions, associated with new editions, tends to improve, but only up to a point. A book of this type is desirable for everyone, but necessary for all who want to keep up to date in the progress of medicine outside the United Kingdom.

The Book of the Fly. By Major G. Hurlstone Hardy. Pages 124. London: William Heinemann. 1915. Price 2s. 6d. net.

This book has the advantage of being written by a layman, and it is to be hoped that it will carry weight with the laity from a practical point of view. It clearly indicates that flies are evidence of insanitation and the hygienic importance of their reduction. The methods of identification of the common house-fly are lucid and ample, being aided by a table of wing-cells and veins. Some other flies and their habits are described; a chapter is devoted to the life-history and another to the structure of the fly. A chapter dealing with the distribution and concentration of flies, as affected by temperature, wind, sunshine, and rain, besides being interesting, gives much information as to the extent of area over which their noxious influence extends. The natural enemies of flies is a subject that raises a feeling of pity for them, and admiration for those who are loath to destroy any form of life, counterbalanced by their being disseminators of disease. Chapters are devoted respectively to remedial measures and control within the house. A chapter supplies the gratifying information that even flies have a sphere of service and utility. They are warning signals which, if regarded, will enable man to fulfil the mission of ruling and subduing the earth.

The book has a useful glossary and a good index.

Amœbiasis and the Dysenteries. By L. P. Phillips, M.D., &c. Pages xi + 147. Demy 8vo. London: H. K. Lewis. 1915. Price 6s. 6d. net.

It is gratifying to meet with a book on dysentery by an author whose name has so often appeared in our columns. This subject is always important, but is doubly so at the present moment.

Amœbic dysentery, historical details, as a commencement are followed by an account of the distribution of amœbæ, method of culture and life-history, the epidemiology, the lesions of intestines, liver, &c. The clinical description of the intestinal symptoms is especially useful. With regard to blood changes the views of Rogers are accepted; the changes in other forms of dysentery are also clearly explained under their appropriate headings.

A chapter is devoted to affections of organs other than the intestine. It is gratifying to feel that in the chapter on treatment ipecacuanha and emetin receive due weight, but other old-established remedies are also given a fair value.

Chapters are also allotted to ciliate, flagellate, and bilharzial dysenteries. The last is particularly interesting to those with large tropical experience, but somewhat scant knowledge of this distinctly wearisome complaint to both patient and doctor.

The consideration of bacillary dysentery is last dealt with in all its aspects. Asylum dysentery and its relation to infantile diarrhœa is somewhat scant, but will probably be treated more fully in a later edition.

The table of contents does not in all cases correspond with the subject matter in the body of the book, but this is amply compensated by a full bibliography and index.

MATERIA MEDICA AND THERAPEUTICS. (An Introduction to the Rational Treatment of Disease.) By J. Mitchell Bruce, M.D., &c., and Walter J. Dilling, M.B., &c. Pages xii + 645. Cassell and Co., London, New York, Toronto, and Melbourne. 1915. Price 6s. 6d.

A hearty welcome greets the tenth edition of this old friend of students and practitioners, containing the changes of the new British Pharmacopœia. New drugs are mentioned, and there are indicated the alterations in the composition, strengths and names of many preparations.

To consider the work as a whole, a comprehensive view is given of the Pharmacopœia. Inorganic chemicals are treated by themselves. This part of the work will profit medical students when attending chemical lectures and doing practical work.

Part II is devoted to vegetable and synthetic preparations. Here the classification is essentially concise, being divided into drugs acting on the digestive system, the blood and circulatory systems, the respiratory, nervous and urinary systems, &c.

Part III is concerned with general therapeutics, and is the complement of Part II, dealing with the treatment of those systems previously mentioned, the digestive, circulatory, nervous, &c.

There is a distinct advantage in this double dealing with the subject both from a theoretical and practical standpoint, which explains the how, the why, and the wherefore, blending definite facts with useful theoretical considerations.

Careful perusal of the work explains why it remains a survival of the fittest of the many works of materia medica and therapeutics, which have been the main stay of students since its first appearance more than thirty years ago. It can be made the mainstay of commencing students and the support of those who have previously studied other text-books.

Collaboration has resulted in the incorporation of the most recent German views. The general format of the book is excellent. The heading of every page indicates the matter dealt with and incalculably facilitates perusal and reference. The type is clear, and the book is light and easy to handle.

New Preparations.

The "Allenburys" Concentrated Food Products (Allen and Hanburys) occupy a gap in dietetic articles, being ready for use or requiring but little preparation. They are available in emergencies, and being easily carried can be used both abroad and at home. Owing to their slight bulk the cost of transport is reduced to a minimum.

The "Allenburys" Diet.—This is a full milk whole wheat preparation; being partially digested it is invaluable for invalids and those whose digestions are incapacitated by disturbances of the alimentary canal, illness past or present, age and fatigue. The addition of boiling water is the sole preparation required.

"Allenburys" Nutrient Lozenges are composed of milk, whole wheat, and the soluble extractives of beef muscle, and supply all the requisites for nutrition. They may be eaten as required, but when slowly dissolved in the mouth they lessen thirst and the feeling of hunger and emptiness which is associated with a diet lacking in bulk.

Meat-soup Squares are specially devised for the rapid preparation of nourishing and sustaining soup. The squares should be cut into fine shreds and allowed to stand for a few minutes in sufficient boiling water to cover them, after which enough boiling water should be added to make a cupful of soup. They also make excellent flavouring gravy.

Milk Cocoa as a beverage, *Milk-food Chocolate* as a concentrated food, and *Café Vierge* (from the Virgin Forests of Costa Rica) merit the attention of exporters and consumers at home and abroad.

Personal Notes.

INDIA OFFICE.

From February 2 to May 4, 1915.

Arrivals Reported in London.—Captain E. R. Armstrong, I.M.S.; Lieutenant-Colonel M. A. Ker, I.M.S.; Major H. C. Long, I.M.S.; Lieutenant-Colonel G. S. Thomson, I.M.S.; Captain A. S. Leslie, I.M.S.; Major E. E. Waters, I.M.S.; Lieutenant-Colonel E. C. MacLeod, I.M.S.; Lieutenant S. S. Sokhey, I.M.S.

Extensions of Leave.—Major E. J. Morgan, I.M.S., 6 m., M.C.; Lieutenant J. D. Wilson, I.M.S., 6 m.; Major A. T. Pridham, I.M.S., 3 m., M.C.; Captain G. R. Armstrong, I.M.S., 6 m., M.C.; Lieutenant Colonel F. W. Gee, I.M.S., 2 m., M.C.

Permitted to Return.—Assistant-Surgeon C. W. D. Dunlop, I.S.M.D.; Captain A. S. Leslie, I.M.S.; D. R. S. Bourke, Major J. Masson, I.M.S.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Armstrong, Captain E. R., I.M.S., to October 21, 1915.
Cox, Major W. H., I.M.S.
Dawson, Lieutenant-Colonel A. W., I.M.S.
Jolly, Captain G. A., I.M.S., to February 15, 1915.
Ker, Lieutenant-Colonel M. A., I.M.S.
Leslie, Captain A. S., I.M.S.
Pridham, Captain A. T., I.M.S., to July 5, 1915.
Robb, Major J. T., I.M.S., to August 11, 1915.
Sandes, Captain J. M., I.M.S., to September 25, 1915.
Sokhey, Lieutenant S. S., I.M.S.
Thomson, Lieutenant-Colonel G. S., I.M.S. to September 23, 1915.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department and the Period for, and Date from, which the Leave was granted.

Justice, Major W. A., I.M.S., Ms., 12 m., November 30, 1914.
Long, Major W. C., I.M.S., Ms., 6 m., January 9, 1915.
MacLeod, Lieutenant-Colonel E. C., I.M S.
Morgan, Major E. J., I.M.S., U.P., 24 m., October 1, 1913.
Robb, Major J. J., I.M.S., Ms., Jails Dept., 12 m., August 12, 1914.
Waters, Major E. C., I.M.S., Bl., 12 m., September 1914.

Original Communication.

THE PIGMENTED PARASITES OF COLD-BLOODED ANIMALS, WITH SOME NOTES ON A PLASMODIUM OF THE TRINIDAD IGUANA.

By C. M. Wenyon.

Director of Research in the Tropics to the Wellcome Bureau of Scientific Research.

THAT pigmented parasites occur in the red blood corpuscles of cold-blooded animals has been known since the first example of such an infection was described by Simond in 1901, who encountered melanin-containing organisms in the red blood cells of the scavenger tortoise of the Ganges. It is generally well known how commonly birds are affected with pigmented blood parasites, either species of Hæmoproteus (Halteridium) which, as far as we know, reproduce by a process of schizogony in the lung or other organs, as described by Aragao for the parasite of the pigeon, or species of Plasmodium which in development follow closely the cycle of the well-known parasites of human malaria.

As the literature relating to the similar parasites of cold-blooded animals is scattered, and some of it difficult to obtain, I have thought it worth while to collect the references to this interesting subject, especially as the discovery of a pigmented parasite in the red corpuscles of the Trinidad iguana (*Iguana sapidissima*) led me to search the literature for any earlier mention of this organism.

History of Discovery of Pigmented Parasites of Cold-blooded Animals.

As already mentioned, the first pigmented parasite of the red blood corpuscle of a cold-blooded animal was described by Simond from an Indian river tortoise (*Trionyx indicus*) of the Ganges and its tributaries. This parasite was named by Simond *Hæmamæba metchnikowi*. In 1905 Laveran found a similar form in blood films made by Theiler in South Africa from a tortoise (*Testudo pardalis*). He described it under the name of *Hæmamœba testudinis*. Four years later (1909) Bouet, under the name of *Plasmodium roumei*, recorded another parasite from the tortoise *Cinixys belliana*, of Tombougou, on the Ivory Coast of West Africa. In the same year Johnston and Cleland in Australia encountered a similar parasite in a tortoise, *Chelodina longicollis*, captured near Sydney. The same parasite they found next year in two other tortoises, *Emydura krefftii* and *Chelodina oblonga*. Employing the generic name suggested by Castellani and Willey in 1904, they called the parasite *Hæmocystidium chelonidæ*. In 1912, Pittaluga, in Spanish Guinea, added yet another tortoise parasite, *Hæmoproteus cajali*, of *Clemmys africana*, while Plimmer in the same year recorded the discovery of pigmented parasites (Hæmocystidium) in five different cheloniidæ which had died in the Zoological Gardens of London. These tortoises belonged to British Honduras, North America and West Africa. Joyeux, in 1913, recorded some observations on Bouet's parasite of *Cinixys belliana*, including his observation of the flagellation of the male gametocyte.

Pigmented parasites of chelonians have thus a very wide distribution, occurring as they do in India, West and South Africa, North and Central America, and Australia. It is possible that further research will show that some of the above organisms are not distinct from one another. At any rate, though described under the names of Hæmoproteus, Hæmocystidium, Hæmamœba and Plasmodium, it is certain that they should all be included under one generic name.

Several pigmented parasites have been recorded from lizards—the first, in 1904, by Castellani and Willey in the tree-dwelling gecko, *Hemidactylus leschenaulti*, of the northern provinces of Ceylon. It was this organism which led to the creation of the new name *Hæmocystidium*, the parasite being called *Hæmocystidium simondi*, in honour of Simond, who was the first to discover a pigmented parasite of a cold-blooded animal. This organism was later studied by Dobell, who gave some details of its multiplication, and by Robertson. In 1909, Wenyon described two parasites from lizards of Wau, in the Bahr-el-Ghazal Province of the Sudan. One of these was named *Plasmodium mabuiæ*, as it occurred in the lizard *Mabuia quinquitæniata*; the other, *Hæmoproteus agamæ*, from *Agama colonorum*. In the case of the latter parasite the male and female gametocytes, which closely resembled the gametocytes of the bird halteridium, were found to behave outside the body of the host just like the bird parasite, the male gametocytes producing male gametes by the process of flagellation, while the female gametocytes became spherical, evidently in preparation for a coming fertilization by the male gametes, as takes place with the pigmented parasites of warm-blooded animals. This was the first instance in which any stage of what must be the invertebrate phase of any one of these pigmented parasites of cold-blooded animals had been observed. Joyeux (1913) has observed a similar development of the male gametocytes of *Hæmoproteus roumei* of the West African tortoise *Cinixys belliana*.

During the year 1909 Aragao and Neiva discovered two of these parasites in South American lizards. One from the snake-lizard *Diploglossus fasciatus*, from Xerem, in the State of Rio de Janeiro, they named *Plasmodium diploglossi*; and the other *Plasmodium tropiduri*, from *Tropidurus torquatus*, of Bicudor, of the State of Minas, in Brazil. Lastly, in 1912, Carini and Rudolph described a parasite of the lizard *Mabuia agilis*, of Minas, Brazil. They named the organism *Plasmodium minasense*.

There still remain the pigmented parasites which have been described from snakes. In January, 1909, Bouet described a parasite from a species of Naja, or Sepedon, both at Odienné, on the Ivory Coast of West Africa, and at Gaoua, in Upper Senegal. This was named by him *Plasmodium mesnili*. In the following month, under the name of *Hæmocystidium najæ*, appeared Wenyon's description of the same parasite from the snakes *Naja hajæ* and *Naja nigricollis*, from the Sobat district of the Sudan. In 1914 M. and A. Léger gave a further description of this organism,

which they found in the spitting snake (*Sepedon hæmochotes*) of the Upper Senegal and Niger district.

Questions of Nomenclature.

The difficulty of classifying the pigmented parasites of the cold-blooded animals is the difficulty which is encountered in the classification of the nearly related parasites of warm-blooded animals. Laveran overcomes this by placing them all in one genus Hæmamœba, which includes all the pigmented parasites of the red blood corpuscles of both warm and cold-blooded animals. It must be admitted that the recent work of Helen Adie on the halteridium of the Indian pigeon lends considerable support to this view. According to her observations the halteridium develops in the hippoboscid fly, *Lynchia maura*, exactly as the malarial parasites of man and proteosoma in the mosquito. If, however, we examine closely the pigmented parasites of birds we find two fairly distinct types. There is, firstly, the organism known popularly as proteosoma. This reproduces by schizogony in the red blood corpuscles of the bird, giving rise to a varying number of merozoites which infect other red blood corpuscles. Eventually certain merozoites enter red blood corpuscles, and, instead of developing into schizonts again, they grow into male or female gametocytes which develop no further in the bird, but follow out the cycle of Ross in the mosquito, ultimately forming sporozoites which are injected into other birds by this insect. Secondly, there is the halteridium of birds, about the development of which there has been so much discussion. As far as the peripheral blood of the bird is concerned, the only forms present in the red blood corpuscles appear to be male and female gametocytes, either fully developed or in process of development from young forms. Schizonts do not occur in the red cells as they do in proteosoma, but Aragao, and more recently Acton and Knowles, have shown for the halteridium of the pigeon that very large schizonts occur in the lungs of young birds, and the present writer has been able to demonstrate that the halteridium of the Bagdad sparrow develops in a similar manner by schizogony in the lung, liver, kidney and possibly other organs of the body. It will thus be seen that the schizogony of halteridium is of quite a different type from that of proteosoma. In the case of halteridium of the pigeon the Sergents, and later Aragao, proved the transmitting host to be a hippoboscid fly, either *Lynchia maura* or *Lynchia brunea lividocolor*. In this fly (and for other species of halteridium possibly in the mosquito) the male gametocyte produces male gametes, and the female gametocyte becomes rounded and fertilization takes place, producing a zygote, which transforms into a motile zygote, or oökinete, just as in proteosoma. In the case of proteosoma, there is a further development of the oökinete into oöcyst and sporozoites, whereas there has been considerable mystery surrounding the further development of the oökinete of halteridium. Schaudinn maintained that in one species it became a trypanosome, while Aragao, the Sergents, and others, failed to trace any further development at all, so that it was suggested that the oökinete might itself find its way into the vertebrate host by regurgitation through the proboscis of the invertebrate, and complete its development in the internal organs. The recent work of Helen Adie in India has cleared up this mystery, for she has shown that the *Hæmoproteus columbæ* of the Indian pigeon produces an oökinete in *Lynchia maura* which develops exactly as does the proteosoma and the malarial parasites of man in the mosquito. There are produced oöcysts, leading to the formation of sporozoites, which eventually infect the salivary glands of the Lynchia. In the great majority of cases all that is known of the pigmented parasites are the forms which are to be met with in the peripheral blood, and a classification based on their appearances there is most useful, provided, of course, it agrees with the further development where known.

The pigmented parasites, then, fall into two main genera: firstly, the genus Plasmodium, which includes parasites which go through the schizogony stage in the red blood corpuscles and produce gametocytes in these cells too; secondly, the genus Hæmoproteus, including parasites which do not reproduce by schizogony in the red blood corpuscles, which cells only contain the gametocytes in varying stages of growth.

In the case of parasites of the genus Plasmodium, a blood film of the peripheral blood of its host will show at some time or another schizonts, male and female gametocytes and young forms of these. In the case of Hæmoproteus, similar blood films will show only male and female gametocytes and young forms of them, but no schizonts.

On this classification the malarial parasites of man and the proteosoma of birds agree in that blood films of the host show schizonts, male and female gametocytes and young forms, and thus they all belong to the genus Plasmodium, a grouping which is substantiated by the identical development which these parasites undergo in mosquitoes. In the case of the halteridium of birds, the blood films constantly show only male and female gametocytes and young forms of these. This absence of schizonts from the red blood corpuscles is associated with a different type of schizogony in the internal organs (pigeon, Bagdad sparrow), while the type of development in the invertebrate (oöcyst development in *Lynchia maura*) is the same as in proteosoma.

A great difficulty of this classification is the fact that in certain instances of evident infection with a parasite of the genus Plasmodium, gametocytes alone may be present in the peripheral blood for considerable periods. In the case of human subtertian malaria it is not uncommon for persons to have only the gametocytes (crescents) present in the red corpuscles for a long time, and usually it is only the early stages of asexual growth which occur in the peripheral blood. The actual schizogony, still in the red cells, however, takes place in the internal capillaries. In these instances, if the schizogony development was unknown, the parasites might erroneously be placed in the genus Hæmoproteus, but future work would correct such an error.

I would therefore suggest that when a pigmented parasite is investigated, and it is found that in the peripheral blood only male and female gametocytes occur, and schizonts are absent, the parasites be placed in the genus Hæmoproteus; while if in the red cells these occur in addition to the gametocytes, also schizonts, then it should be placed in the genus Plasmodium.

With reference to mammals it has been found that whenever there has been sufficient investigation the development is of the plasmodium type, so that probably all mammalian pigmented parasites will belong to the genus Plasmodium, though in some cases only gametocytes have been described. Many forms, especially those of monkeys, were only known in the gametocyte stage for some time. Subsequent investigation has shown that they reproduce asexually by schizogony in the red blood cells. In the case of birds, however, the two forms, Plasmodium and Hæmoproteus, occur. It is probable that a good many distinct species of bird plasmodium exist besides the first and best known example, *Plasmodium præcox* (proteosoma). Laveran and Marullaz have recently described a very small form from a Japanese bird (*Liothrix luteus*) under the name of *Hæmamœba tenuis* (*Plasmodium tenue*). Similarly it is equally probable that many species of Hæmoproteus exist, but when one has in nearly all cases only the gametocytes to go by, it is impossible to divide up the genus with anything like accuracy. It is better, therefore, to designate these parasites, great numbers of which occur, merely *Hæmoproteus sp.*, or merely the popular name, Halteridium, coupled with the name of its host.

Returning now to the pigmented parasites of cold-blooded animals, it is found that they may be divided naturally into two groups corresponding to the hæmoproteus and plasmodium of birds. In certain cases prolonged search has failed to reveal in the red blood corpuscles any other stages than the male and female gametocytes and the younger growing forms of these; in others the corpuscles contain not only the male and female gametocytes, but also schizonts. It is possible, of course, that in some cases members of the former group will, with further investigation, be found to have schizogony forms in the red blood corpuscles in certain stages of the infection. It is not known whether any of the first group reproduce by schizogony in the internal organs, as has been shown for the hæmoproteus of the pigeon and the Bagdad sparrow. It will be seen that some of the pigmented parasites of cold-blooded animals are very clearly allied to the common proteosoma of birds, so that they cannot be included in any other genus than that of Plasmodium. The small parasite to be described below, which has been found in the red blood corpuscles of the Trinidad iguana, corresponds very nearly with Laveran's small *Plasmodium tenue* (*Hæmamœba tenuis*) of the Japan bird, *Liothrix luteus*. It happens in these cases that the red corpuscles of the lizards in question approximate in size to the average dimensions of the red corpuscles of birds, so that the particular parasites agree not only in appearance and development, but also in size. In many reptiles, however, the red blood corpuscles are very large, reaching a length of 20 microns, so that a parasite inhabiting one of these cells, and occupying the same proportion of it, is actually much larger than a similar parasite of a smaller type of red blood corpuscle. If we consider, for instance, the parasite first described by Castellani and Willey from the gecko of Ceylon (*Hemidactylus leschenaulti*) it is found that, with large blood corpuscles, the gametocytes, producing alteration of the red cell, may attain a length of 18 microns, while the schizonts, according to Dobell, measure only 8 microns, and divide usually into two, sometimes into four, merozoites. The parasite of the Trinidad iguana is a very much smaller organism and inhabits a smaller red blood corpuscle, the average diameter of which is about 14 microns. The schizonts of this parasite are not more than 4 microns in diameter, and the gametocyte two or three times this size. Again, a similar parasite from the lizard *Agama colonorum*, of the Bahr-el-Ghazal Province of the Sudan, is a little larger, the schizonts being 7 to 8 microns in diameter, and the gametocytes about 14 microns in length and halteridium-like. In this case the red blood corpuscles are 13 to 18 microns in length. It appears, therefore, that the size of the parasite depends, to some extent, on the size of the red cell of its host, which in some way or another limits the growth, and that there is a gradual transition from the small forms, like the parasite of the iguana, to the large ones, like Castellani and Willey's parasite of the Ceylon gecko.

We now come to the point of this discussion, which is as follows: If it is necessary to place the small iguana parasite in the genus Plasmodium, and there seems to be no other alternative on account of its very close resemblance to certain species of plasmodium of birds, how is it possible to place the larger forms—a series gradually increasing in size—in any other genus? At the time that Castellani and Willey created for their parasite of the gecko the new genus, Hæmocystidium, the only other similar form known was Simond's large parasite of the Indian tortoise of the Ganges. Since that time other smaller forms have been discovered, linking these larger parasites with the smaller forms of birds, and Dobell has shown that Castellani and Willey's parasite reproduces by schizogony in the red blood corpuscles, so that there no longer exists any distinctive data on which to define the genus Hæmocystidium. It is certainly impossible to overcome the difficulty by asserting that all these parasites of cold-blooded animals must be sufficiently different from those of birds to justify their inclusion in a separate genus, Hæmocystidium. If one asks what these differences are, it is quite impossible to state them, since we have seen that size alone is of insufficient value. Dobell, in his account of the parasite of the Ceylon gecko, gave the following points in favour of retaining the genus Hæmocystidium:—

(1) The intracorpuscular parasite is never amœboid.

(2) Schizogony takes place by simple bipartition into two merozoites, rarely into four.

(3) They are confined to cold-blooded vertebrates.

Examining these points we find, firstly, that the parasite of *Agama colonorum* of the Sudan, and the small one, mentioned several times in this paper, from the Trinidad iguana, are certainly amœboid in the growing stages of the schizonts. Secondly, schizogony may result in more than two or four merozoites, as shown by the iguana parasite just mentioned, which produces uniformly four merozoites, and by the two forms described by Aragao and Neiva from his South American lizards. In one, called by them, *Plasmodium tropiduri*, there result at least ten merozoites, while in the other, *Plasmodium diploglossi*, there may be as many as forty. Thirdly, the limitation of these forms to cold-blooded animals is hardly a reliable feature when, as we have already seen, some of them are extraordinarily similar to certain pigmented parasites of birds.

There seems, therefore, to be no other alternative than to include in the genus Plasmodium those pigmented parasites of the red blood corpuscles of cold-blooded animals which show in these cells the schizogony stage as well as the gametocytes. It may be urged that subsequent research will indicate that these parasites undergo developments in invertebrates which are very different from those in which the parasites of warm-blooded vertebrates develop. This again, if it were more than mere speculation, would not justify a new generic name. A comparison with the trypanosome group is instructive in this connection. These flagellates occur, as do the pigmented intracorpuscular parasites, in mammals, birds and reptiles; yet they are all grouped in the genus Trypanosoma, and this in spite of the fact that in the invertebrate some develop in Glossinæ, leading to infection of the proboscis or salivary gland, whence they are injected into the vertebrate host; others develop in the hind gut of fleas, whence they escape in the fæces and accidentally infect the vertebrate which eats the fæces (*T. lewisi*); while others develop in leeches and lead to infection of the proboscis sheath, and thence to the infection of a vertebrate. There are here many more data for the creation of separate genera than in the case of the pigmented intracorpuscular parasites, but it is to be hoped that no one will attempt to split up this group into separate genera till exact definitions can be given.

Accordingly, in describing the pigmented parasites of cold-blooded animals, I will employ the two generic names, *Plasmodium* and *Hæmoproteus*, as they have been defined above for the parasites of birds.

The Parasite of the Trinidad Iguana

(*Iguana sapidissima*).

This parasite was discovered in blood films made from two specimens of this reptile (*Iguana sapidissima*), by E. B. Connell, of Trinidad, who must be complimented on the very excellent films he has been kind enough to send to the Bureau. The dried films were stained with eosin-azur stain. The red blood cells of the iguana measure on an average 13 to 14 microns in length, being about the average size of the red blood corpuscles of birds. The growth of the parasite in the red cells produces very little change in the character of the cell. The larger gametocytes sometimes cause a slight increase in size of the cell, and a displacement of its nucleus, but this is exceptional; while occasionally the infected cells tend to stain blue, but as some uninfected cells have this tendency also it is impossible to ascribe this feature to the presence of the parasite. The youngest stages of the parasite are very minute and situated, as a rule, at one end of the cell (fig. 1). They consist of vacuolated cytoplasm and a small chromatin mass. They increase in size and acquire one or two grains of brown pigment (figs. 2 and 4). The parasites appear to be very irregular in shape—indications of amœboid activity. They are commonly elongated with a narrow pseudopodium-like prolongation (fig. 3). Preparation for schizogony is shown by division of the chromatin body into two parts: the two chromatin bodies then divide to form a total of four nuclei, which appears to be the maximum number (figs. 3 to 7). The subsequent division into four merozoites takes place in one of three ways, which are merely accidents of the chromatin and pigment arrangement. In one case the cytoplasm is roughly quadrangular, with a chromatin mass at each corner, while the pigment is aggregated at the centre. Division into merozoites gives rise to a characteristic cross form very much like the small cross forms of the horse piroplasma (figs. 7 and 8). In another case the pigment is arranged at one side of the parasite and the four chromatin bodies round it in a semi-circle, so that division into merozoites produces a typical fan-like arrangement (figs. 9 to 11). Finally, the merozoites, instead of being in one plane as in the fan-like form, are arranged in a cone with the pigment at the apex of the cone (fig. 12). In whichever way segmentation occurs the number of merozoites appears to be regularly four. The fully grown schizont has a diameter of 3 to 4 microns. In addition to the schizonts there occur larger forms which are evidently gametocytes (figs. 13 to 16). These are of various shapes and considerably larger than the schizonts. They may be confined to one end of the red cell with a tendency to push the nucleus out of place, or they may grow round the nucleus in a halteridium manner. Their shape is either that of a kidney bean or sausage, while one figure shows an irregular, possibly amœboid form. The pigment in these larger forms is very scanty, and in some is difficult to see, especially when obscured by the chromatin. This was the case with the largest form figured on the plate (fig. 16). There was difficulty in differentiating male from female gametocytes, though some stained much more deeply than others, so that there probably exist the usual sexual distinctions. It is interesting to note that pigmented leucocytes containing large quantities of pigment occurred in the film. This is all the more remarkable when the small amount of pigment in each parasite is noted.

As regards the affinities of this organism, they are undoubtedly with those of the Plasmodium group. Laveran has recently described a small parasite from the bird *Liothrix luteus*, of Japan. In this parasite

the schizonts occupy the ends of the red cells and give rise to four, or sometimes more, merozoites. The gametocytes are elongated and lie round the nucleus, as the gametocytes of the iguana parasite may do. The likeness of the two is remarkable. Laveran names his parasite *Hæmamœba tenuis*, which, according to the scheme adopted here, becomes *Plasmodium tenue*.[1]

In 1912 Carini and Rudolph described a parasite of the South American lizard, *Mabuia agilis*, under the name of *Plasmodium agilis*. From their description and their four figures (three of gametocytes and one of a schizont) it would appear that there is nothing to distinguish the parasite from that of the Trinidad iguana described above. The single schizont figured has the typical fan arrangement with four chromatin bodies and the pigment at the apex. Though it is a long distance from the lizard, *Mabuia agilis*, of the State of Minas, in Brazil, on the banks of the Rivers Paranahyba and Bagagem, to the iguana (*Iguana sapidissima*) of Trinidad, one is compelled to include both these forms in the one species under the name of *Plasmodium minasense* (Carini and Rudolph, 1912).

I will now give a list of pigmented parasites of cold-blooded animals all of which are reptiles. They will be considered as Plasmodium if the schizonts as well as gametocytes occur in the red cells, or as Hæmoproteus if only the gametocytes occur.

Two observations are exceedingly important in giving descriptions of these parasites. Firstly, slight variations in staining reaction are of very little value, for everyone who has used the Romanowsky stains knows how differently the various modifications may stain one and the same object. This is true also, to a great extent, of different samples of the same stain. Secondly the degree to which the red blood corpuscles appear to be altered in shape by the parasite depends in large extent on the interval of time elapsing between the death of the animal and the making of the blood films. If the blood is drawn from the living animal and the films immediately made, then a fairly true picture of the blood corpuscle is obtained, but very frequently animals are shot and films made, it may be, some hours after death. In the case of elongated gametocytes of the halteridium type the extra-corporeal development of these may take place to some extent during the interval. The first stage of this development is a contraction of the halteridium gametocytes to a spherical body, during the process of which the red cells become very much distorted, though in the circulating blood of the living animal there may have been no deformity. This is frequently observed in the case of halteridium of birds, and is probably equally true of the closely allied parasites of reptiles. In giving descriptions of these parasites it is, for this reason, well to state exactly how and when after death the films were made, so that these changes, which are really stages of the development which would normally occur in the invertebrate host, can be excluded.

Parasites of Lizards.

Six parasites have been described from the red cells of lizards, and they all belong to the genus Plasmodium.

Plasmodium simondi. Castellani and Willey, 1904 (syn. *Hæmocystidium simondi*, Castellani and Willey, 1904).

Parasitic in the red blood corpuscles of *Hemidactylus leschenaulti*, a tree-dwelling gecko of Ceylon. The parasite was discovered by Castellani and Willey in a specimen from Mamadu, near Vavuniya, in the Northern Provinces. These observers described only male and female gametocytes and young forms, and they suggested the generic name Hæmocystidium. It was later studied by Dobell and Robertson. According to Dobell there occur schizonts 8 microns in diameter. These divide into two, or rarely four, merozoites which are 4 to 5 microns in diameter. Male gametocytes fully grown completely fill the corpuscle, and have a length of 18 microns. The nucleus is divided into several irregular chromatin masses. The female gametocyte is about the same size and more deeply staining. It has a characteristic vacuole and a nucleus divided into two parts. The red blood corpuscles are considerably distorted, and the nucleus displaced by the growth of the parasite.

Plasmodium agamæ. Wenyon, 1908 (syn. *Hæmoproteus agamæ*, Wenyon, 1908).

Parasitic in the red blood cells of the lizard *Agama colonorum*, from Wau, in the Bahr-el-Ghazal Province of the Sudan. The youngest stages are minute bodies at the end of the red cells. The fully formed schizont, measuring 4 to 7 microns, lies at the end of the cell and has about 6 chromatin masses.

Male and female gametocytes measure about 14 by 4 microns, and lie to the side of the nucleus in the halteridium manner. The female stains more deeply than the male. Formation of male gametes by the male gametocyte was observed to take place as in halteridium and the malarial parasites by flagellation. This is the first instance in which microgamete formation has been observed in the case of a pigmented blood parasite of a cold-blooded animal. The red cells of the host measure 13 to 18 by 8 to 12 microns. They are not altered by the parasite, unless it be a slight displacement laterally of the nucleus due to pressure of the gametocytes.

Plasmodium mabuiæ. Wenyon, 1908.

Parasitic in the red blood cells of the lizard *Mabuia quinquitæniata* of Wau, in the Bahr-el-Ghazal Province of the Sudan.

[1] The description of this parasite appeared in the *Bull. Soc. Path. Exot.*, January 14, 1914. The name *Hæmamœba tenuis* becomes *Plasmodium tenue* if the generic name Plasmodium is employed for the malarial parasites. Two months later, in the *Proceedings of the Royal Society* for April 8, 1914, Stephens used the name *Plasmodium tenue* for a peculiar form of a human malarial parasite. It is evident, therefore, that even if Stephens's parasite should prove worthy of specific rank, the name he has used cannot stand.

The younger stages are small, irregular amœboid masses of cytoplasm, which appear to be closely applied to the host cell nucleus, and from which they thrust out pseudopodia into the surrounding cytoplasm. The parasite may possibly be partly intranuclear. Pigment is present in the form of fine grains which may be clustered into several groups. The forms which are applied to the nucleus may have one or more chromatin bodies. As the parasite increases in size it seems to leave the host cell nucleus and lies as a roughly spherical body in the cytoplasm of the cell. The schizonts are circular in outline and have a diameter of about 5 microns. They contain about 6 chromatin dots, and give rise presumably to as many merozoites. Male and female gametocytes measure about 8·5 by 5·5 microns and occupy one end of the red cell, with often a narrow prolongation extending a short distance along one side of the host cell nucleus. The female gametocyte stains more deeply than the male. Formation of male gametes from the male gametocytes was not observed, though in some films made from the blood of animals which had been dead some time were observed what appeared to be microgametes. The red cells of the host, which measure 15 to 20 by 6 to 10 microns, are not altered by the parasite.

Plasmodium tropiduri. Aragao and Neiva, 1909

Parasitic in the red blood cells of the lizard *Tropidurus torquatus.* It was discovered by Aragao and Neiva in films made from lizards in Bicudos, in the State of Minas in Brazil. It was only studied in stained films. The parasite occupies the ends of the red cells and shows no tendency to grow round the nucleus in the halteridium manner. The youngest forms are minute bodies consisting of cytoplasm and chromatin. As growth proceeds, pigment appears, till the fully grown schizont, roughly circular in outline, measures 7 to 8 microns in diameter and contains up to twelve nuclei. It gives rise to as many as twelve merozoites. Female gametocytes are deeply staining pigmented bodies, 6 to 8 microns in diameter. Male gametocytes, larger than the female, are pale staining, and measure 9 microns in diameter. The growth of the parasite causes some deformity of one end of the red cell and some change in the nucleus. Aragao and Neiva point out that this parasite closely resembles the proteosoma (*Plasmodium præcox*) of birds.

Plasmodium diploglossi. Aragao and Neiva, 1909.

Parasitic in the red blood corpuscles of the snake lizard, *Diploglossus fasciatus.* The parasite was discovered by Aragao and Neiva in two specimens of the reptile, from Xerem, in the State of Rio de Janeiro, while two specimens from Ouro Fino, in the State of Minas, were not infected. Attempts were made to infect other lizards (*Tropidurus torquatus, Hemidactylus mabuia, Ameiva surinamensis* and *Mabuia agilis*) by blood inoculation, but were not successful. The youngest forms of the parasite are minute ring bodies not more than 2 microns in diameter, and consisting of blue staining cytoplasm and chromatin dot and central vacuole. With growth the parasite becomes elongated, and grows round the nucleus till this may be completely surrounded. The schizonts are elongated bodies which completely or partially surround the host cell nucleus in the halteridium manner. Nuclear multiplication takes place till as many as forty nuclei are present. Segmentation into a corresponding number of merozoites follows. The gametocytes have much the same shape as the schizonts and surround the nucleus as in halteridium. The male gametocyte is slightly smaller than the female and has coarser pigment granules. After removal from the body the gametocytes become spherical, but no formation of male gametes was observed by flagellation.

The normal red cell measures about 15 by 9 microns. With growth of the parasite the cells become pale in colour and considerably enlarged, up to 19 by 11 microns. The nucleus, however, is not displaced, nor is there any deformity of the cell.

Plasmodium minasense. Carini and Rudolph, 1912.

Parasitic in the red blood cells of the lizard *Mabuia agilis*, from the State of Minas in Brazil. It was discovered by Carini and Rudolph in specimens from the banks of the rivers Paranahyba and Bagagem. A form which appears to be identical with this one has been found, as recorded in this paper, in the Trinidad iguana, *Iguana sapidissima.* The normal red corpuscles of the iguana are about 14 microns in length and the parasite causes hardly, if any, alteration in these. The nucleus may be slightly displaced by the larger forms. The schizonts are about 4 to 5 microns in diameter and divide into four minute merozoites which, in separating, may be arranged as a cross, in a fan-like manner or a cone. The pigment occupies the centre in the cross forms and the apex in the others. The gametocytes are round ovoid, or halteridium-like, and may measure 8 to 9 microns by 2 to 4 microns. Certain differences in staining suggest male and female gametocytes. The pigment in all the forms is very scanty.

PARASITES OF CHELONIIDÆ.

Five species have been described from tortoises. They are all about the same size, and the adult forms can be distinguished as male and female gametocytes. The pigment granules are abundant. In some cases the parasites appear to be limited to one end of the red cell, while in others they show a tendency to lie at the side of the nucleus in the true halteridium manner. It is doubtful if the species are all distinct, especially the three African species. They have been placed here in the genus Hæmoproteus according to the definition given above.

Hæmoproteus metchnikovi Simond, 1901 (syn. *Hæmamœba metchnikovi*, Simond, 1901).

Parasitic in the red blood corpuscles of the scavenger tortoise (*Trionyx indicus*) of the Ganges

and its tributaries. It was first found by Simond in all of twenty tortoises examined.

The only adult forms found in the blood are gametocytes; the male, staining faintly, has coarse, irregularly distributed pigment grains and a large central nucleus represented by a diffuse collection of chromatin granules. The female, staining more deeply than the male, has finer pigment grains which are often aggregated round a more compact nuclear body situated in the thickest part of the parasite. Young parasites of both types are present. The gametocytes, which measure 6 to 10 microns in diameter, occupy, as a rule, one end of the red cell, but may send up a blunt prolongation along one side of the nucleus. None of them have been described as lying round the nucleus in the true symmetrical halteridium manner. The red cells of the tortoise, which are about 20 microns in length, are very little, if at all, altered by the parasite, nor are the nuclei displaced.

Hæmoproteus cajali. Pittaluga, 1912.

Parasitic in the red blood corpuscles of a tortoise (*Clemmys africana*) of Spanish Guinea, on the West Coast of Africa. It was discovered by Pittaluga in 1909. No measurements of the parasite or red cells are given. The figures show male and female gametocytes very much like those of *Hæmoproteus metchnikowi.* Young forms also exist. The author speaks of schizonts, but the figures given do not show any indication that the forms are such, as there is only one nuclear body. It seems probable that all forms figured are gametocytes. Some gametocytes lie round the cell nucleus in the typical halteridium manner. The pigment is in the form of coarse yellow-brown grains. There is practically no alteration in the shape or form of the red cells, which will be probably found to be about 20 microns in length, so that the parasite would be about the same size as *H. metchnikowi.*

Hæmoproteus roumei. Bouet, 1909.

Parasitic in red blood corpuscles of the land tortoise, *Cinixys belliana*, of West Africa. The parasite was discovered by Bouet at Tombougou, on the Ivory Coast, and later by Joyeux in French Guinea, and by Plimmer in a specimen of the same tortoise which died in the Zoological Gardens in London. There are male gametocytes, which may be spherical with a diameter of 9 microns, or oval measuring 14·4 by 3·6 microns; and female gametocytes, which when spherical have a diameter of 12·6 microns, and when oval measure 16·2 by 10·8 microns. The red cells, which normally measure 19·5 by 11 microns, may be increased in size by infection till they come to measure, as in one case, as much as 23·4 by 12·6 microns. There is practically no distortion of the cell though the nucleus is generally somewhat displaced. Joyeux found nineteen infections out of thirty-four tortoises examined. He noted that microgamete formation by flagellation of the male gametocytes took place readily, if the blood was placed in the moist chamber for a few moments. Infected blood was injected into an uninfected *C. belliana* and a *Testudo ibera* without result.

Hæmoproteus testudinis. Laveran, 1905 (syn. *Hæmamœba testudinis*, Laveran, 1905).

Parasitic in the red blood corpuscles of the South African tortoise, *Testudo pardalis.* It was discovered by Laveran in blood films sent him by Theiler from South Africa. Only gametocytes are present. These may be oval or reniform with a measurement of 10·12 microns in longest diameter, and occupying one end of the red cell, or they may be curved round the nucleus in the halteridium manner, when they measure 20 by 7 or 8 microns. The female gametocytes can be distinguished from the male by their deeper staining. The youngest forms are non-pigmented bodies about 3 microns in diameter. The size of the normal red cell is not given, but, as with the other tortoises, it will probably have a length of about 20 microns. There is no alteration in the shape of the nuclei.

Hæmoproteus chelonidæ. Johnston and Cleland, 1909 (syn. *Hæmocystidium chelonidæ*, Johnston and Cleland, 1909).

Parasitic in the red blood corpuscles of *Chelodina longicollis, Emydura krefftii* and *Chelodina oblonga* of Australia. The parasite was first found by Johnston and Cleland in a specimen of the tortoise *Chelodina longicollis* captured near Sydney in 1909. In 1912 they record the finding of the same parasite in two other tortoises, *Emydura krefftii*, from Petre's Creek in Queensland, and *Chelodina oblonga* taken near Perth. The parasite in all cases lies between the nucleus and one end of the red cell. A few forms were circular in outline, but the majority were elliptical or of a distorted reniform shape. The parasites varied in size from 4 by 3 to 12·5 by 10 microns. Some were deeply staining with rather smaller pigment grains than those possessed by other more faintly staining ones. Two vacuoles were usually present, but they varied in position. The red cells of the tortoises measure from 17 to 18·5 by 10 to 12 microns.

Hæmoproteus sp. (Plimmer 1912), from the following cheloniidæ which had died in the Zoological Society's Gardens in London.

Three-keeled terrapin (*Staurotypus triporcatus*) of British Honduras, painted terrapin (*Chrysemys picta*) of North America, Home's Cinixys (*Cinixys homeana*) of West Africa, eroded cinixys (*Cinixys erosa*) of West Africa, and Bell's cinixys (*Cinixys belliana*), of West Africa. Plimmer, who records these, says that they probably fall under the heading Hæmocystidium. They all have pigment and when large have rather the appearance of Hæmoproteus. The infected cells are not altered.

PARASITES OF SNAKES.

Only two of these have been recorded, but it seems probable that both belong to one species.

Hæmoproteus mesnili. Bouet, 1909 (syn. *Plasmodium mesnili*, Bouet, January 9, 1909, *Hæmocystidium najæ*, Wenyon, February 3, 1909).

Parasitic in the red blood cells of the cobras, *Naja hajæ*, and *Naja nigricollis* of the Sobat district of the Sudan, and *Sepedon hæmachotes* of the Upper Niger and Senegal in West Africa. It was discovered by Wenyon in two snakes in the Sudan in June, 1907, and what is probably the same species was later discovered by Bouet and named by him *Plasmodium mesnili* from a *Naja sp.* or *Sepedon sp.* from Odienné and from the same species of snake from Gaoua in Upper Senegal. Subsequently (1914) M. and A. Léger found this parasite in the spitting snake (*S. hæmachotes*) from Upper Senegal and Niger.

Only gametocyte forms have been seen in the blood. The youngest are non-pigmented bodies, 2 to 3 microns in diameter, with a small chromatin dot and vacuole. Increasing in size they become pigmented and grow round the nucleus in the halteridium manner. The fully formed gametocytes and the younger forms of these can be distinguished as male and female by the deep blue staining of the female and the pale pinkish staining of the male by Romanowsky stains. The male gametocyte, as usual, has a larger and more faintly staining nucleus than the female. The gametocytes may measure as much as 21 microns in length, while the cytoplasm is filled with numerous coarse brown or yellow pigment grains. In large numbers of parasites occur double infections of the cells, while gametocytes of like or different sex is common. M. and A. Léger found that the male gametocytes outnumbered the female in the proportion of 10 to 1.

The normal red cells of the host measure about 17 by 8·5 microns. Though definitely increased in size up to 22 to 25 by 14 microns when they contain large parasites, there is, as a rule, no deformity or displacement of the nucleus, except in the case of doubly infected cells. No details of development are known.

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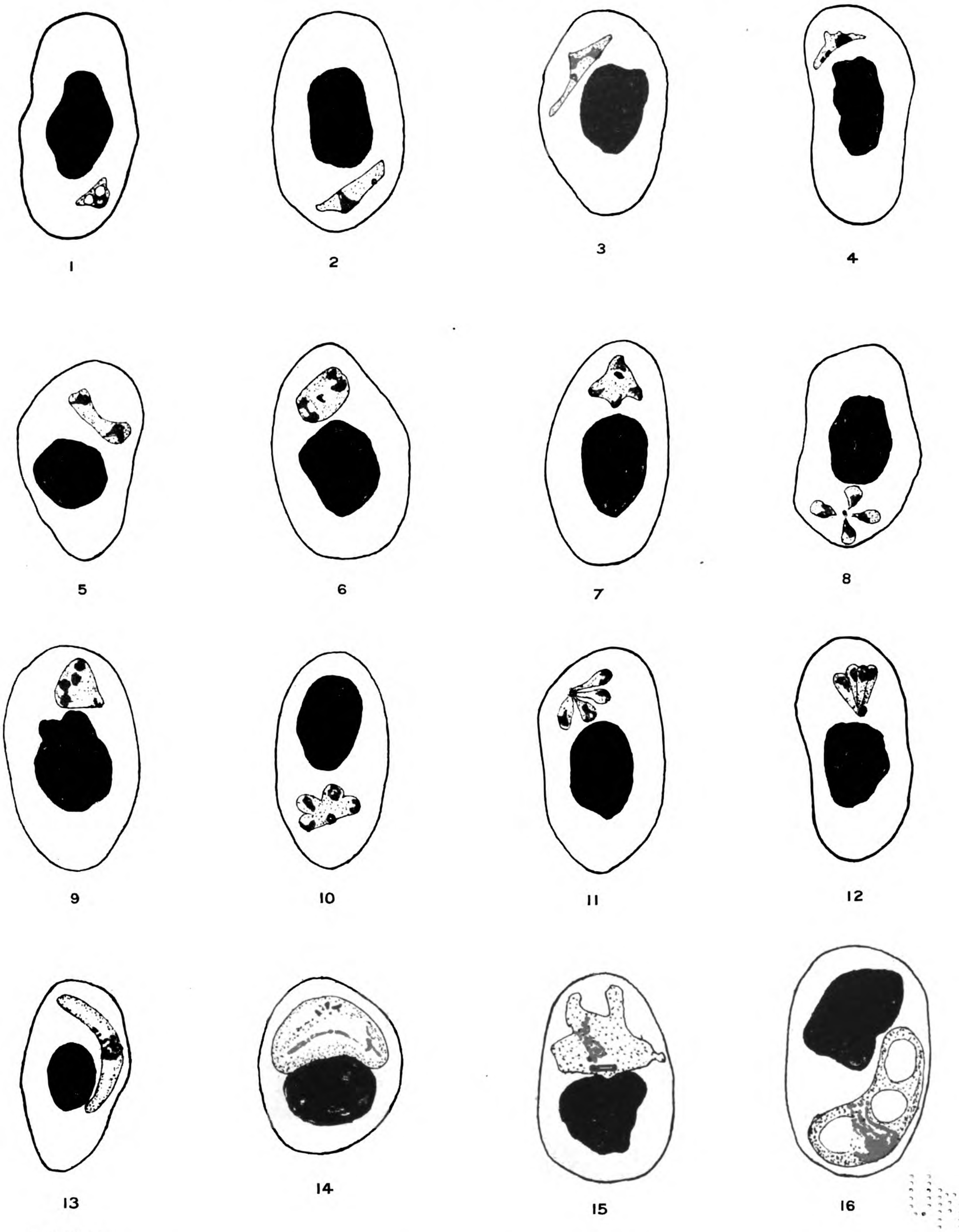
Description of Plate.

The plate illustrates the various forms of *Plasmodium minasense* met with in the blood films of the Trinidad iguana (*Iguana sapidissima*). All the drawings are to the same scale, the magnification being 2,500.

Fig. 1.—Young unpigmented form.
,, 2.—Larger form with single grain of pigment.
,, 3.—First nuclear division.
,, 4.—Form with two pigment grains.
,, 5.—Larger form with two nuclei.
,, 6.—Second nuclear division.
,, 7.—Four nuclear form preparing for division.
,, 8.—Four merozoites in cross arrangement.
,, 9.—Four nuclear form in fan arrangement.
,, 10.—Later stage of fan form.
,, 11.—Four merozoites in fan arrangement.
,, 12.—Four merozoites in cone arrangement.
,, 13.—Elongated gametocyte, possibly female.
,, 14.—Larger gametocyte with irregular nucleus, possibly male.
,, 15.—Irregular form, possibly gametocyte.
,, 16.—Large gametocyte; pigment not visible, possibly covered by nucleus.



PLASMODIUM MINASENSE IN RED BLOOD CORPUSCLES OF *IGUANA SAPIDISSIMA* × 2,500.

To illustrate paper by C. M. WENYON, "The Pigmented Parasites of Cold-blooded Animals, with some Notes on a Plasmodium of the Trinidad Iguana."

Abstract.

A PRELIMINARY REPORT ON SOME FURTHER INVESTIGATIONS ON KALA-AZAR IN THE SUDAN.[1]

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INTRODUCTION.

THE Sudan Kala-azar Commission was formed in October, 1909. For nearly four years researches were carried out and valuable evidence was obtained.

Khartoum has never proved itself to be an endemic centre of kala-azar—a fact not to be ignored—particularly when researches necessitated the use of a large number of animals for inoculation purposes; but arrangements were made for the transfer of cases of kala-azar from out-stations to the Military Hospital, Khartoum, and every facility was given to study the disease and obtain material.

INOCULATION EXPERIMENTS.

A preliminary series of experiments was performed to ascertain what animals in the Sudan were susceptible to an infection with the parasite of kala-azar. For these experiments intraperitoneal inoculations with infected material were carried out and positive results were obtained in the following animals:—

(*a*) Grey monkey, *Lasiopyga callitrichus* (I. Geoffroy, 1851). This animal was formerly described as *Cercopithecus sebæus.*

(*b*) Jerboa, *J. gordoni.*

(*c*) Gerbil, *G. pygargus.*

(*d*) Pup, *C. domesticus.*

In the gerbil and jerboa the disease appears to run a chronic course, in no way impairing the health of these animals. Negative results were obtained in guinea-pigs, rabbits, cats, a kitten, a cheetah and pigeons. A dog was also inoculated intravenously with material obtained from a splenic puncture. The animal did not develop any symptoms and was killed seven months later, but no Leishmania parasites were found in either the spleen, liver, or bone-marrow.

CULTURAL CHARACTERS OF THE PARASITE.

For the study of the cultures, strains have been obtained from infected monkeys and from spleen and liver punctures carried out on three kala-azar cases.

In suitable media fully developed flagellates appeared about the third day, followed by multiplication and by division, resulting in rosette formation, and as the cultures became older the parasites reverted to their original type, losing their flagella and becoming thick-walled oval cells or cysts. The cultures grew readily under anaerobic conditions, but the growth of the flagellates was not quite so luxuriant as in aerobic cultures.

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, November, 1914.

THE CYTOLOGICAL CHARACTERS OF THE FLAGELLATE.

To study the cytological characters of the flagellate young cultures were used, so as to obtain dividing forms and avoid degenerating or altered forms. The preparations were wet fixed, and stained either with iron hæmatoxylin or Giemsa; when the latter was used the technique employed was that recommended by Surgeon-General Sir David Bruce for trypanosomes, the specimens being finally differentiated by orange tannin. In using the iron hæmatoxylin stain it was found advisable to put up several preparations illustrating various degrees of differentiation.

By these two methods of staining, the main characters of the tropho- and kineto-nuclei could be observed. In a culture six days old flagellates of varying sizes and in various stages of development could be seen in the same preparation. The body of the adult flagellate measured 14 to 21 microns in length and 1 to 2 microns in breadth, while its flagellum measured 16 to 24 microns in length. The tropho-nucleus occupied a more or less central position, was vesicular in type, and limited by a well-defined nuclear membrane, on the inner surface of which could be seen fine chromatin dots. Within the nuclear sap zone, and occupying a central position, was an intensely staining karyosome; but in none of the preparations was it possible to observe a centriole in the interior of the karyosome. Between the tropho-nucleus and the anterior extremity of the body the clearly stained karyosome of the kineto-nucleus could be seen as a rod lying transversely to the long axis of the parasite. In some flagellates this rod was slightly curved, with the convexity in a posterior direction. In iron hæmatoxylin stained specimens the karyosome was often found occupying the more or less central position of a clear zone which, as in the tropho-nucleus, was limited by a nuclear membrane. Some flagellates showed the karyosome in an eccentric position and frequently opposed to the posterior area of the nuclear membrane.

At the anterior portion of the nuclear sap zone and close to the karyosome a basal granule could be frequently seen, the so-called blepharoplast; from the basal granule the rhizoplast originated. In some of the flagellates, instead of a definite basal granule being present there was a thickening of the rhizoplast, which represented its site of origin. Flagellates were also found in which the rhizoplast appeared to originate directly from the karyosome; it would be difficult to state definitely whether in such cases a false impression was given, owing to the fact that the basal granule was in reality in a lower plane than the karyosome.

In specimens stained by Giemsa and differentiated with orange tannin, the nuclear membrane of the tropho-nucleus showed the presence of numerous fine granules. These were more frequently seen in dividing forms of the flagellates, and in all probability corresponded to chromosomes. Other granules were seen between the tropho-nucleus and the posterior extremity, which resembled the volutin particles met

with in trypanosomes. It was never possible to demonstrate any filament connecting the tropho- with the kineto-nucleus.

In the dividing forms the process of fusion usually commences in the basal granule of the kineto-nucleus, and is followed simultaneously with a division of the rhizoplast and flagellum. The new rhizoplast soon becomes detached from the other at its anterior extremity, and it, in turn, gives origin to the new flagellum. During this process the karyosome of the kineto-nucleus becomes elongated and constricted in its centre. Elongation continues, and each half of the karyosome moves further apart, till complete separation occurs.

From what can be observed in wet fixed specimens the tropho-nucleus undergoes similar changes to the kineto-nucleus, the nuclear chromatin dividing into two separate masses; but, prior to this, numerous granules are seen within the nuclear membrane. The division of the tropho-nucleus usually follows that of the kineto-nucleus, but in some instances a flagellate is observed with two tropho-nuclei and but a single karyosome in the kineto-nucleus.

Biological Experiments to test the Effects of Sunlight, Temperature, 0·2 per cent. Hydrochloric Acid, Tap Water, Sterile Distilled Water, River Water, and Bacillus Coli.

The inference drawn from these few experiments is that the cultural forms of *Leishmania donovani*, as met with in the Sudan, are possessed of greater vitality than they are given credit for in other countries. Under unfavourable conditions, short of immediate death, the flagellates tend to revert to a cystic stage, where, possessed with thicker walls, they are apparently endowed with greater vitality, and capable of greater resisting powers. They correspond to the cystic or post-flagellate forms of herpetomonads found and described by Patton and myself in the hind gut of the bug.

Agglutination experiments, inoculations with cultures, and feeding experiments with fæces all proved negative.

Feeding Experiments with Emulsions of Liver, Spleen, and Bone-marrow.

These were carried out with the object of noting whether infection by Leishmania could occur via the intestinal tract.

Owing to lack of suitable media no cultures could be made, but a healthy monkey, *L. callitrichus*, was inoculated intraperitoneally with 2 c.c. of an emulsion made from the spleen and liver of the fed monkey. The monkey was isolated and kept under observation. At the end of ninety days it was found to be showing signs of anæmia and was killed on the one hundred and twenty-third day after inoculation. Its spleen was enlarged and congested and somewhat firm in consistence. The liver showed evidence of congestion and the bone-marrow was red. Smears from the spleen and bone-marrow showed a fair number of typical Leishman-Donovan bodies free and phagocyted. The smears from the liver showed a fairly heavy infection with the same parasites.

This experiment points to the fact that the healthy monkey fed with kala-azar material contracted the infection; but owing to the short time that it lived after the experiment, few Leishman-Donovan bodies were present, and these were apparently missed in the *post-mortem* examination. That there was an infection, however, was shown by the results of the intraperitoneal inoculation carried out on a healthy monkey.

In a second feeding experiment the spleen from a fatal case of kala-azar was minced up, and about 5 grm. administered *per os* to a healthy monkey, *L. callitrichus*. No apparent abrasions were present in the mouth. The animal was examined one hundred and thirty-two days afterwards, and found to be showing signs of anæmia and an enlarged spleen. A liver puncture was carried out, and the smears made showed a fairly heavy infection with typical Leishmania parasites.

These two experiments have been considered worth recording, for, as far as the writer knows, they are the first instances in which a Leishmania infection has been produced by feeding animals with infected material.

A third feeding experiment was carried out with a healthy pup, the infected material being obtained from the liver and spleen of two inoculated monkeys. No definite Leishmania parasites were found in the spleen and bone-marrow. The liver showed oval and round cells about seven microns in diameter which contained "coccal bodies" identical with those described by Smallman and myself in certain cases of kala-azar.

In a recent and somewhat critical paper Wenyon refers to them and states that he has found these bodies in the livers of uninoculated dogs and rats, and therefore concludes that they are in no way connected with Leishmania.

It is strange that in the course of several hundred animal examinations carried out in the Sudan during the last six years one has not encountered these bodies in uninoculated animals.

Similar bodies have recently been observed by Chalmers in lung smears from a gerbil previously inoculated with a human strain of trypanosome and a homologous immune serum. They have also been recently obtained in liver smears from a soldier who was admitted to Kurmok Hospital during an outbreak of kala-azar that occurred last autumn.

It is at present impossible to state their exact nature, but one is still inclined to consider them of protozoal origin, and in some way closely associated with Leishmania.

Feeding by Cultures.

A healthy pup was used for this experiment with the object of ascertaining whether the animal would develop infection. The same precautions were observed as in the previous feeding experiments. The animal was fed on eight different occasions with strains of cultures obtained from kala-azar cases.

The cultures varied from eight to fifteen days old. Three months later the animal showed signs of anæmia. The peripheral blood and liver smears were carefully examined for evidence of *P. canis*, but with negative results.

Cultures from the liver blood were inoculated into N.-M.-N. media and yielded negative results, and a monkey was also inoculated intraperitoneally with an emulsion of the dog's liver, spleen, and bone-marrow. Owing to the failure to find Leishmania parasites one can only conclude that the animal was either not infected or had so few parasites that they were difficult to find. The pathological changes present in the liver and spleen certainly suggested a Leishmania infection and not a piroplasmosis.

Vaccination by Cultures.

For this experiment a healthy monkey, *L. callitrichus*, was used. The hair over the left shoulder and left leg was shaved off and the surface of the skin for an area of ¾ in. in diameter lightly scraped so as to produce an abraded surface. A heavily infected culture, three days old, obtained from an adult with kala-azar, was pipetted on to the surfaces of these abrasions and allowed to dry before the animal was replaced in its cage. The animal was carefully examined every week for evidence of any local condition developing over the vaccinated areas. On the one hundred and twenty-sixth day the animal was killed. No apparent skin lesions were present. Numerous smears from the liver, spleen, bone-marrow, endocardium and lung were examined, but with negative results. Culture tubes inoculated with material from the liver showed no evidence of a Leishmania infection.

Remarks on the Disease as met with in the Sudan.

On clinical grounds alone it is apparent that there are two types of the disease, an acute form, which usually has a fatal result within a few weeks or months of the individual reporting, and a more chronic form in which the patient lives for a year or more without any apparent symptoms, the enlarged spleen containing Leishmania parasites being the only indication that the individual is affected with kala-azar.

Speaking generally the disease appears to be equally prevalent among adults and children, and up to date there appear to be insufficient data to draw any material distinction between the varieties affecting the adult and the child.

The endemic areas of this disease have been mapped out, and broadly speaking correspond to the Kassala, Sennar and Blue Nile Districts. Since then, however, a case in an adult female has been found in Talodi, in South-western Sudan, and the evidence obtained shows that this woman contracted the infection in that district. Another probable centre of infection exists at Um Ruaba, a station two degrees north of Talodi, and in the same province. This point is of epidemiological interest, for it gives support to the view that the disease existed in the west in the pre-Mahdi days, and may have been introduced to the Blue Nile and Kassala districts by the raids of the Baggara Arabs in the time of the Mahdi.

At Kurmok, an outstation on the Abyssinian frontier, there occurred a small outbreak of kala-azar.

Nine cases occurred in the IVth company of the XIVth Sudanese between the middle of June and the middle of September of last year. The salient symptoms were cough and fever. Three of these cases had definitely enlarged spleens and three had enlarged livers. Six deaths occurred, and the remaining three were transferred to Khartoum. Two out of the three showed a heavy infection with Leishmania parasites, and the third patient, who arrived in Khartoum several months later, was kept under observation. His spleen and liver were enlarged, but he had no pyrexia. The spleen extended two fingers' breadth below the costal margin and was extremely firm in consistence. Splenic puncture was carried out with a small hypodermic syringe, but owing to the marked fibrosis which was apparently present, no material was obtained and in the interests of the patient it was not deemed advisable to carry out a second puncture. A liver puncture was performed; no Leishmania parasites were found, but, as already mentioned, cells containing the "coccal bodies" described by Smallman and myself were present. When seen two months later the spleen and liver had returned to normal size and the patient appeared to be perfectly well. His peripheral blood showed a definite eosinophilia.

This is the third occasion in which these bodies have been found in the Sudan and in all three instances the patients presented the clinical signs and symptoms of kala-azar and recovered from the disease. Cultures of liver material from the third case were inoculated into an N.-M.-N. media, but no flagellates developed. A monkey was also inoculated intraperitoneally, and is being kept under observation.

One of the two cases from Kurmok whose spleen showed a heavy infection with Leishmania was also found to be infected with a micro-filaria which morphologically and in other ways corresponded to *M. perstans*.

(*To be concluded*).

Annotations.

Multiple Ligation of Varicose Vein. K. Secher (*Hospitalstidende*, April 14).—The technique introduced by Schede and Kuzmik is simple and free from danger, while it takes comparatively little time and the outcome is excellent and permanent. It can be applied in the home or surgery and is thus particularly useful for the general practitioner. In most of 155 cases the varices were extremely pronounced and of long standing. Under general anæsthesia a silk suture thread or catgut is passed around under the vein, without

exposing the vein, and this is repeated at intervals along the vein. The ends of each thread are then tied over a roll of gauze and the patient stays in bed one or two weeks. Schede applies the catgut threads at 2 cm. intervals and removes them after two or three days, and lets the patient get up with a bandage the eighth day. Kuzmik uses silk, at 5 cm. intervals, and leaves the threads unmolested for twelve days.

Tartar Emetic in Leishmaniosis.—Torres's (*Brazil Medico*, April 1) three patients were men aged 19, 40, and 43, and the ulcerations in the throat and nose were of several years' standing. A complete cure has been realized in one case under the intravenous injections of the antimony and potassium tartrate, and the others are recovering. The first was given about forty injections, representing a total of 4·6 grm. tartar emetic. The lesions in the mucous membrane are much harder to cure than those on the skin. The latter yield promptly to this treatment. It has no action on syphilis, and the measures found useful in syphilis have no effect on leishmaniosis; as in a case of leishmaniosis in a child with inherited syphilis. The manifestations of the latter subsided under mercurial treatment, leaving the leishmaniosis unmodified, and this subsided under the tartar emetic. The solution for injection must be made up fresh and the course commenced with small tentative doses. Local applications may hasten the cure.

Reviews.

The Medical Annual. Thirty-third Year. 1915. Pp. cxx + 959. John Wright and Sons, Ltd. Bristol. Price 10s. nett.

An Annual that has reached its thirty-third issue makes little call upon the labours of a reviewer beyond reminding his readers to procure the book. The present number is fully equal to all its predecessors and contains an epitome of the literature of the whole medical world.

In the table of contents, it seems a pity that there is no reference to the various parts. As to Part II, p. 74, the contents heading is "Review of Medical and Surgical Progress"; on reference to that page, the heading is "Dictionary of Treatment," which, in the table of contents is entered as p. 80, where it does not occur. The glossary is but little different to that of last year.

The account of the 1914 British Pharmacopœia is fully set forth in a manner to facilitate ready reference. In fact, it obviates the drawback of the new British Pharmacopœia as the prohibition of free use before January caused considerable confusion. The care and labour devoted to the Annual is shown by the unification of drugs, when reference is made to them in various parts of the book.

The publishers announce the appearance shortly of a "Synoptical Index" of the past ten volumes of the *Medical Annual*.

New Preparation.

Galyl (Arsenical Preparation) for Intravenous Injections (M. Bresillon and Co., Gamage Buildings, E.C.).—This preparation has been tried for a considerable period in France, its colonies, and elsewhere. As the result of numerous laboratory experiments, as well as practical use in animals and man, one forms the opinion that in syphilis it is equal to any of the salvarsan-like preparations. In yaws and trypanosomiasis it is superior, and has the advantage of being unaffected by the heat of the Tropics. It is administered in concentrated solution, so requires no additional chemicals or any apparatus beyond a syringe. In addition, Galyl is not recorded as having produced the anomalous results due to alterations in its method of preparation or strength.

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Original Communication.

TRICHOPHYTON VIOLACEUM VAR: KHARTOUMENSE.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.,
Director, Wellcome Tropical Research Laboratories,

and

Norman Macdonald,
Junior Bacteriological Laboratory Assistant, Wellcome Tropical Research Laboratories, Khartoum.

Introductory.—The present communication is the fifth of a series of short notes published in this Journal on the subject of "Tinea Capitis Tropicalis" in the Anglo-Egyptian Sudan.

In the first of these notes Chalmers and Marshall dealt generally with the subject of "Tinea Capitis Tropicalis" and described a new species of Trichophyton which they named *T. currii*. In the second the same authors discussed the systemic position of Malmsten's genus *Trichophyton* with special reference to some of their observations on *T. currii*, and classified it in Baranetzkey's family *Gymnoascaceæ*, which belongs to the fungal class *Ascomycetes*. This class is generally assigned to de Bary, but we believe that this is probably incorrect, as Berkeley in 1857 uses the term, placing his own name after it, and giving as a synonym *Endothèques Léveillé;* moreover, he gives a good definition and states that "the essential character of this important division consists in the development of definite or indefinite sporidia within certain of the external cells of the hymenium called asci."

The third note was also by the same authors, but dealt with *T. discoides* Sabouraud 1909; while the fourth paper by ourselves considered the animal inoculations of this fungus.

The following remarks are brought forward because they record for the first time a variety of *T. violaceum* in the Anglo-Egyptian Sudan.

Historical and Geographical.—This rather pretty fungus was discovered by Sabouraud in 1892 in a "Tinea Circinata" on a man who had come from what he calls "the Soudan," which is altogether a different place from the Anglo-Egyptian Sudan, being that portion of the Sudan which is situate in West Africa, and is often called the Western Sudan or Haute-Guinée. He described its cultures on maltose gelatine in the following words (quoted from his work "Les Teignes," p. 302):—

> "Culture acuminée, violet lilas, dont la surface dorsale noire est incisée profondément."

In 1895 he gave a more exact account of the parasite, and in the same year Mibelli found it in a case of sycosis and onychyosis in Parma, where one year later Pelagatti recorded its discovery thirty times in fifty-six examinations of cases of ringworm, while Ducrey and Reale described the formation of "duvet" on its cultures. Since this date it has been observed by many investigators, being found by Truffi in Pavia, by Minnie in Ghent, by Krzysztalowicz in Cracow, where it is the most common cause of ringworm; by Du Bois in Geneva, by Adamson and Colcott Fox in England, and by Nicolau in Roumania, where it was very commonly found to be the cause of tinea capitis.

For a long time this fungus did not possess a name in accord with the rules of botanical nomenclature, being simply known as "*Trichophyton à cultures violettes* Sabouraud," but in 1902 Bodin brought it into accord with these rules by calling it *Trichophyton violaceum* Sabouraud; but it is not possible to retain Sabouraud's name after this species, as it owes its correct nomenclature to Bodin and not to him, and hence the name becomes *T. violaceum* Bodin 1902, with Sabouraud's more popular appellation as a synonym.

When the papers mentioned above are studied a very curious difference appears, some authors claiming the fungus to be a pure endothrix, while others say that it is an ectothrix, some maintaining that its clinical features resemble those of *T. tonsurans* Malmsten 1845, and others that they are suppurative and may produce kerions.

This is so curious that it requires careful consideration. Sabouraud's explanation is as follows:—

> "Si l'on examine une de ces trichophyties au moment où elle se constitue, on trouve le parasite presque purement ectothrix avec des chaînes faites d'éléments gros et souvent difformes. Si l'on envisage l'infection bien établie on voit à n'en pas douter que le *T. violaceum* est un endothrix pur. La phase d'envahissement du *T. violaceum* est courte et ne me semblerait pas justifier l'incorporation de ce parasite au group des Tr. Néo-endothrix chez lesquels cette phase persiste beaucoup plus longtemps et devient un caractère différentiel."

With regard to the history of *T. violaceum* in tropical countries it will be observed that it was originally discovered by Sabouraud in 1892 in a man who came to Paris from West Africa.

In 1902 Bodin recorded it as present in North Africa, and in 1904 Gaulais saw it causing "Tinea Capitis" in Arab and Jewish children in Algiers, where Brault and Viguier in 1914 also encountered the parasite as an endothrix.

In 1905 Castellani found it causing "Tinea Capitis" in Ceylon. His parasite had the following characters:—

(1) It was an ecto-endothrix.
(2) It produced a form of ringworm of the scalp in children characterized by enormous numbers of pityriasic squamæ, and followed by permanent alopecia.
(3) There are only very slight cultural differences, as may be seen by comparing the illustration on Plate V, fig. 6, of the "Manual of Tropical Medicine," by Castellani and one of us, with the figure depicted on Plate X of Sabouraud's "Les Teignes."

Castellani considered the differences from the typical species to be sufficient to justify the creation of a new variety, which he called *T. violaceum varietas decalvans* Castellani 1905.

In 1907 Rabello recorded the presence of *T. violaceum* in Brazil, and in 1911 Sabouraud stated that Uriburu had found that it was common in Buenos Ayres, where it was thought to have been introduced by immigrants from Italy.

In 1914 de Napoli isolated *T. violaceum* eleven

times in Tripoli. It is also said to be known in Asia Minor.

From this history it would seem as though Italy in ancient times may have been the home of the disease, and from this centre it may have spread by Roman conquests and Italian emigrations to various parts of Europe, Asia, Africa and America.

Its frequency in Roumania can easily be understood on this assumption, as these people are, in part at least, descendants of Trojan's legions.

Sabouraud thinks that Jews at the present time are the great carriers of the disease, especially as twenty out of his twenty-five cases coming from outside France were Jews from the Levant, the Black Sea Provinces of Russia, and from Austrian Poland.

We will now give some account of our observations in Khartoum, though it is not necessary to go into full details with regard to this well-known fungus.

Anglo-Egyptian Sudan.—So far we have only found *T. violaceum* once, in a young Sudanese girl living in Khartoum North and attending the American Mission Girls' School.

It was a typical case of "Tinea Capitis" (fig. 1), resembling closely that caused by *T. currii*.

The affected hairs showed a typical endothrix, large spored type of Trichophyton, with a resistant mycelium filling the hair shaft in much the same manner as that described for *T. currii*.

One of the hairs, being placed on Sabouraud's maltose agar, after twenty-six days' incubation at 23° C. developed a violet growth (fig. 2).

On examination this culture was seen to consist of a raspberry-coloured central knob situate on a violet-coloured plateau, which was marked by well-defined radial grooves, and surrounded by a white fringe.

After forty-four days' growth (fig. 3) the various colours as seen by morning sunlight in these laboratories may be named according to Ridgeway's "Book of Colour Standards," in which they may be seen depicted, as follows:—

Central Knob.—Pomegranate purple; *vide* Plate XII, 71. V-RR, i.

Plateau.—Blackish-red purple; *vide* Plate XII, 67. V-R, m.

In this culture the medium was observed to have taken on a scarlet red, over which the violet-coloured growth, with its white fringe and its reddish knob, produced rather a pretty effect.

The coloration of the medium, according to the book mentioned above, was:—

Coloured Medium.—Scarlet red; *vide* Plate I, 3. O-R, between b and i.

By capping the tube the moist appearance of the growth was preserved and gradually the white fringe was lost (fig. 4). When subcultured (figs. 5 and 6) it grows at first quite colourless (fig. 7), but gradually acquires its violet tinge.

Its growth on Sabouraud's glucose agar is depicted in figs. 7, 8 and 9, in which the non-coloration of a sector is well seen in figs. 8 and 9.

With regard to its cultivation in Sabouraud's maltose and glucose gelatine, we encountered the great difficulty that it at once began to liquefy the gelatine, as is shown in fig. 10. This action was tested repeatedly in various tubes and on different batches of sugar gelatine media, but always with the same result, and as this did not occur in the control tubes we are compelled to consider it to be a characteristic of the variety of *T. violaceum* found here.

The growth on potato is poor and not characteristic; it is depicted in fig. 11.

The fungus grew fairly well in the laboratory sugary and alcoholic peptone media, but without producing any characteristic reactions.

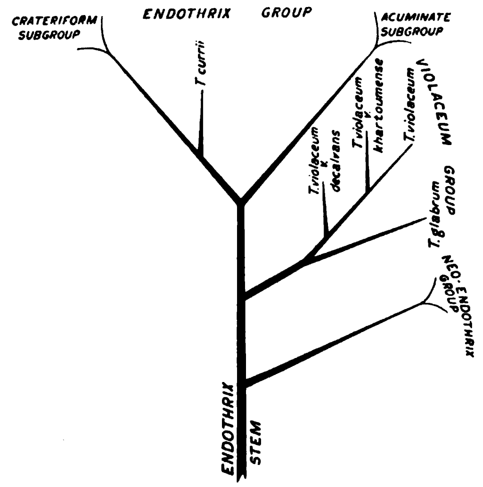

Diagram to show the possible relationships of the Violaceum Group.

Relationships.—In considering the *Violaceum Group* with regard to its relationship to other Trichophyton groups, it would appear from the remarks of Sabouraud upon the temporary character of its Ectothrix stage that it should form a special group, coming between the *Neo-Endothrix* and the more truly *Endothrix Groups*, the latter of which comprises the acuminate and crateriform subgroups.

We therefore detach its line from the acuminate stem, as illustrated in the diagram given by Chalmers and Marshall, to show the relationships of *T. currii*, and attach it to the main Endothrix stem (*vide* text figure) below the true Endothrix group, but above the Neo-Endothrix group. In the true Endothrix group it is closely related to *T. currii*, as can be seen by comparing fig. 9 with one of the illustrations of a growth of *T. currii* as depicted in Chalmers and Marshall's paper.

With regard to *T. violaceum var: decalvans*, which shows a marked Ecto-Endothrix condition, we consider this to be more primitive than those varieties in which the Endothrix stage pure and simple is evident, while Sabouraud's satellite, *T. glabrum*, being pale brown in colour, also appears to us to be

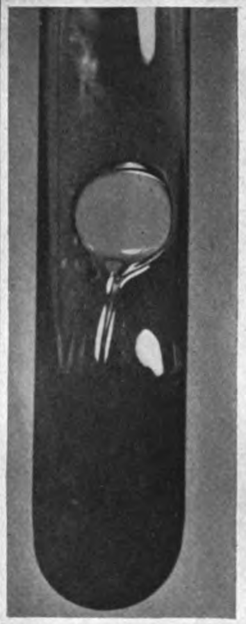

Fig. 10.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

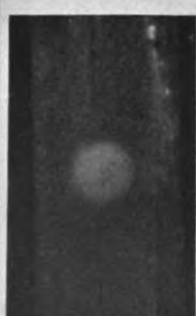

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 11.

To illustrate paper, "*Trichophyton violaceum var : Khartoumense*," by ALBERT J. CHALMERS and NORMAN MACDONALD.

less specialized than the violet varieties, but this point will not be certain until the parasite is better known.

The Khartoum Variety.—It appears to us that the variety of *T. violaceum* which we have found in Khartoum is new, because:—

(1) It showed no signs of any Ectothrix stage, which therefore must be more or less transient.

(2) In very old patches it showed no sign of inflammation.

(3) Its cultures on maltose and glucosa agar appear to differ slightly from Sabouraud's typical illustrations.

(4) It liquefies gelatine, which has not so far been described in any other variety of *T. violaceum*.

We therefore give it the name of *Trichophyton violaceum varietas khartoumense* Chalmers and Macdonald 1915, and distinguish it by the above-mentioned characters.

Clinical Features and Treatment.—The clinical appearances (fig. 1) which we have observed have been indistinguishable from those described for *T. currii*, and therefore the diagnosis must be based on the cultural characters of the parasite. For particulars on this point reference may be made to the paper by Marshall and one of us on "Tinea Capitis Tropicalis in the Anglo-Egyptian Sudan," in THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE for 1914.

The treatment we have adopted has been, as usual, the tobacco soap.

Khartoum,
March 10, 1915.

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ILLUSTRATIONS.

These illustrations may, with advantage, be examined by means of a lens.

FIG. 1.—The vertex of the head of a young Sudanese girl shaven to demonstrate the lesions caused by *T. violaceum var: khartoumense* Chalmers and Macdonald 1915. *Note* the resemblance to the lesions of *T. currii* as illustrated in Chalmers and Marshall's paper. *Photograph.*

FIG. 2.—*T. violaceum var: khartoumense.* Original culture direct from the child's head depicted in fig. 1, and grown on Sabouraud's maltose agar for twenty-six days at 23° C. *Photograph.*

FIG. 3.—*T. violaceum var: khartoumense.* Same culture as that depicted in fig. 2, but after forty-four days' cultivation. *Photograph.*

FIG. 4.—*T. violaceum var: khartoumense.* Same culture as that depicted in fig. 2, but after eighty-one days' cultivation, mostly at 23° C. *Photograph.*

FIG. 5.—*T. violaceum var: khartoumense.* Subculture from the growth depicted in fig. 3 on Sabouraud's maltose agar after fifteen days at 23° C. *Photograph.*

FIG. 6.—*T. violaceum var. khartoumense.* Same growth as that depicted in fig. 5, but after twenty days' growth. *Photograph.*

FIG. 7.—*T. violaceum var. khartoumense.* Young colourless growth on Sabouraud's glucose agar. *Photograph.*

FIG. 8.—*T. violaceum var: khartoumense.* Growth on Sabouraud's glucose agar for eighteen days at 25° C. *Note,* one sector is uncoloured. *Photograph.*

FIG. 9.—*T. violaceum var: khartoumense.* Same growth as that depicted in fig. 8, but after twenty-three days. *Photograph.*

FIG. 10.—*T. violaceum var: khartoumense.* Growth on Sabouraud's maltose gelatine at 18° C. for fourteen days. *Note,* Bubble caused by the liquefied gelatine, at the bottom of which the small growth is visible. The dark area at the bottom of the tube indicates the liquefied gelatine. *Photograph.*

FIG. 11.—*T. violaceum var: khartoumense.* Growth on potato after twenty-three days at 25° C. *Photograph.*

Cerebellar Symptoms in Myxœdema.—Odin (*Hygiea*, Stockholm, No. 6) gives an illustrated description of a woman aged 52, previously healthy and with healthy children, who had developed myxœdema in the last ten years. The gait finally became slow and dragging, as likewise the speech, and certain groups of muscles displayed a tendency to catalepsy and other cerebellar phenomena. Under thyroid treatment of the myxœdema the cerebellar ataxia and other symptoms promptly disappeared.

Fatigue and Exhaustion.—C. Jacobi (*Münch. med. Wochenschr.*, April 6) refers to war conditions as a result of which one man persists in his efforts and becomes a temporary hero, while another collapses and is regarded perhaps as a shirker. Some of the latter, however, may have been half-starved when they were called upon, while others may have been undernourished—even tuberculous. However, exhaustion means more than a high degree of fatigue. A difference obtains here in regard to protein and carbohydrate insufficiency in utilization. If ordinary energy food (carbohydrate) is not available the organism must draw upon protein food and protein tissues, for energy supplies. In other words, muscular tissue is consumed to supply heat and energy. This means exhaustion, structural and functional, and anything short of this situation may be conceived of as some degree of simple fatigue. The highest degrees of fatigue appear to be associated with a particular condition of the circulation, which in theory should respond to stimulation. The milder degrees of fatigue may be offset by the use of the caffeine substances used under the form of coffee, tea, cocoa, kola, &c.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 1, 1915.

THE PART BIRDS PLAY IN HEALTH AND DISEASE.

OF all the birds the insect-eaters are the most important group from the public health point of view. Were it not for their predatory attacks on insects the globe would be overrun by these so-called pests, vegetation would suffer or completely disappear, and the animal kingdom would, except those "beneath the earth" and in the sea, stand a chance of becoming extinct. The farmer, as he views his newly sown seeds being unearthed by swarms of birds, his corn crops when ripe stripped bare to the stalk, and his root crops devastated, not unnaturally starts out with his gun to drive off and to kill these destructive and greedy destroyers of his crops. Yet if the birds are exterminated or even reduced below their proper proportion there would be no crops, or if any struggled to maturity they would be so poor that they would not be worth gathering, and the world would be poorer in foodstuffs. When the Hungarian farmers combined to wage war on the sparrow (*Passer domesticus*) their campaign was followed by an increase of devastating insects, which in a few years threatened famine, and they were only too glad to reinstate the sparrow and regard him as a friend, not an enemy. The same story is repeated from many countries. When the martins in the island of Bourbon were destroyed, grasshoppers took their place and brought the island and its people to the verge of ruin, averted only by allowing the martin to return. In France bird life at one period in the fifties of last century fell to such small proportions, owing to anyone being granted a licence to shoot birds of any and every size and species, that the agriculture of the country became so deficient that a Government inquiry was held. Strict rules were passed against the wanton destruction of birds, as the Commission appointed came to the conclusion that the disappearance of birds had allowed the insects to increase to a dangerous extent. Nebraska, U.S.A., in 1877 was overrun by locusts, attributed to the destruction of blackbirds, quail, plover, &c., being a systematic attempt to get rid of "destructive" birds by administering poisoned grain, a plan which had been in vogue for some years previous to 1877.

A region rich in birds, the plumage of which is used for millinery purposes, may come to swarm with insects destructive to agriculture, and as in Jamaica, to cattle as well, owing to the prevalence of ticks.

The monument erected in Salt Lake City, Utah, U.S.A., to the black-headed gull testifies to the part played by the gulls of this species in destroying the myriads of black crickets which, by attacking the ripe grain in the fields, threatened to compel the early Mormon settlers to seek shelter elsewhere than around the Salt Lake.

The visitation of swallows to Northern Europe is an economic factor of vital importance, for these birds, the greatest of all insect-eaters, serve to reduce the actual numbers of the adult insect and provide also thereby to diminish their potential increase for the ensuing year. Forest trees harbour insect pests, which gradually bring about their destruction; but the tree shelters birds also, which in turn prey upon the insects and check their increase, a balance of "things natural" which brings home to one the interdependence of all animal and plant life: for were we to destroy our birds we would lose our trees; to lose our trees would alter

our climate. In our orchards and our gardens the value of birds to keep down insects and other pests is an everyday experience.

But it is not insect-eaters alone that preserve the economic state in Nature. Rapacious birds, such as owls and hawks, play an important part. Small rodents of many kinds cause incalculable damage to corn in the field, in the stack, and in the barn, to young vegetables in our gardens and fields, to clover and other grasses, to flowers and to wellnigh every variety of vegetable life. It is owing to the hawk and the owl that the superfluity of small rodents is kept under. Moreover, birds of prey also help to check the abnormal increase of small insect-eating birds themselves and thereby help the farmer in a double fashion. On the other hand, birds inhabiting lakes and sea or lake shores, by consuming small batrachians, crustaceans, flies, and larvæ of insects, check the local destruction of plant life. To cattle, horses, sheep, goats, &c., birds are an insect protector of the greatest value. Insects not only torment the animals to, at times, desperation, but they also infect them with diseases, which means ruin to the farmer and a great loss of local food.

As regards disease, have we not traced malaria, yellow fever, filaria, tick fever, plague, and many other ailments to their insect hosts; hosts which are welcome food to birds and by which disease is frequently conveyed to man and animals. So convincedly has this proved to be the case that the American Government has forbidden the destruction of wild birds in the Canal Zone in the Isthmus of Panama under a heavy penalty, an example of applied sanitation well worthy of imitation. As a weed destroyer or as a scavenger, birds have proved useful to a degree but little appreciated. The decaying refuse matter, especially in fishing villages on our coasts, is consumed to a great extent by gulls and other sea fowl; and just as vultures serve as scavengers in many inland places, so the gulls in the littoral help to arrest diseases caused by decaying vegetable and animal matters.

The bird world has not yet been systematically examined for the purpose of elucidating how far birds are direct carriers of disease; how far they serve as alternative hosts for many of our disease-producing parasites; nor how far the parasites which inhabit their feathers, skins, blood, and digestive organs are communicable to men and animals. As the birds are predatory to so many pests, so in all probability the parasites which find shelter in these pests find also a suitable breeding ground in the birds which consume them so largely. There is here a great field for investigation; for many of our epidemic diseases, and more especially pandemic ailments, may find explanation by studying more closely the diseases which are capable of being harboured and spread by the most rapid and widespread of disseminators, namely, the birds.

Annotations.

German Army Bread.—At the Hygienic Institute, Berlin (*Deutsch. med. Wochenschr.*, April 1, 1915), Citron stated that the majority of those present had agreed that the recently legalized wheat bread was unacceptable to a small number of patients with gastro-enteric affections. The bread in question is 90 per cent. wheat to 10 per cent. rye. Granting that in saving a certain amount of wheat the rye addition works harm to a certain number of people, rolls which contain 67·5 grm. of pure wheat flour will not only save so much wheat, but will not irritate the gastro-enteric tract. At the same time there is no violation of the law. This is only a suggestion, based on the fact that the 75 grm. roll is made of mixed flour. Naturally, the patient loses 7·5 grm. of each roll, but this loss he can endure. Michaelis condemns rye-flour-potato bread outright. Cardiac and gallstone subjects, and the aged, bear this badly, on account of the flatulence caused. He questions at present the need of wheat flour economy; but as soon as this need is demonstrable, the substance should be saved up for the sake of the invalid. Fürbringer believes that wheat and potato flour make a better bread than wheat and rye flour. Gottstein refers to the part played by home baking in the manufacture of war bread. Should the regulation bread not agree, it is provided by the law that home-made bread may be obtained from the community. Boas discusses a bread made of potato flour and skim milk, which makes up in availability that which it lacks in palatability. The gastro-enteric disturbances should not be ascribed to diet alone, but to army life in general. Flügge, the Chairman, mentions real and imaginary patients in connection with diet. It is the business of the army surgeon to discriminate here. This author, like numerous others, knows nothing of a real shortage of wheat at present. Germany used to be exposed to this contingency, but this is not necessarily the case at present. In fact, the rye, rather than the wheat, may need conservation. A wheat consumer cannot yet be shown to be a traitor to his country, but a rye flour consumer may already be a dyspeptic. Ewald states that potato flour enters into the composition of so-called "aerated bread" in England, and much more fully than in any of the German war breads. He ate some of this bread when in England, and has even given it to the sick, and none objected. The home-made bread of the United States is a simple affair and can be readily made by German housewives. Kuttner gave the standardized war bread to hyperchlorhydrics and achlorhydrics; it disagreed in both cases, although no reason could be assigned. The hyperchlorhydric suffered mostly in the stomach, the achlorhydric in the bowels. Probably the very small pores of the war bread have something to do with it. The author made a research into the digestibility of war bread by pepsin and

trypsin, and has also used the same bread in trial breakfasts. In the artificial experiments the new and old breads show no difference in digestibility. But in trial breakfasts the chyme from army bread is much more lumpy and frothy than that from ordinary bread. Umber mentioned a very aggravated series of cases of organic stomach disease in which the army bread was well tolerated. He ascribes this result chiefly to good baking. Schmidt mentioned the great toleration of the gastro-enteric tract to nutriment of all kinds; notwithstanding which a certain number of subjects known as chronic dyspeptics could not use army bread without both subjective and objective disturbances. Rubner states that there have been many complaints of army bread, but that he has yet to see a victim of it. We must not forget, however, that ordinary bread is often poorly baked. Rye bread in general gives off butyric acid in the intestine. The so-called coarsely milled wheat, asserted to contain valuable ingredients, tends to escape by the bowel in the form of indigestible cellulose. Baginsky insists that in many ailments of the gastro-enteric tract with their secondary cardiac and renal disorders only the very finest wheat flour should be used. Albu claims that, for the healthy, army bread is sufficient.

Abstracts.

CIRCUMCISION AMONGST SOUTH AFRICAN NATIVES.[1]

By G. A. TURNER, M.B.

AMONG the M'Xosa and Pondomisa tribes, in the Cape Colony, circumcision is not carried out until the boy is from 17 to 20 years of age, that is, until he is a man and able to take his own part. The circumcised boy is known as "indoda," while the uncircumcised, even though he be an adult, is still referred to as an "umfaan" or "kwedin."

The circumcised M'Xosá looks upon the uncircumcised adult boy with contempt, referring to him as a pig, in no way considering him a man (much in the same way as the ancient Hebrews referred to the uncircumcised as "arelem ").

Among the M'Xosa, those to be operated on are collected in a camp capable of containing from ten to twenty boys. For each boy[2] that goes into the camp there is a cow and a calf kept for milking purposes, and nearly all the food is prepared in the camp; cattle, &c., being killed there. Women are, as on the east coast, strictly prohibited admission. If a woman did enter a camp, she would, in the old days, certainly have been killed.

While in the camp the boys are subjected to a good deal of hardship; they are beaten, &c., so that they may become hardened and fit to bear the responsibilities of adult life.

Livingstone describes how he saw a part of the ceremony as performed among the Bechuanas. Just at dawn of day a row of boys about 14 years of age stood naked in the circumcision camp. Each had a pair of sandals as a shield on his hands. The men, also naked, were arranged opposite them, armed with long rods of "moretloa" (*Grewia flava*). They commenced a dance, during which they asked the boys questions, such as "Will you guard the chief well?" &c. As the boys give the affirmative response the men rush forward and each aims a blow at the boy opposite to him. The boy shields his head with the sandals and causes the supple wand to descend upon his back. Every stroke makes the blood spurt from a wound 1 ft. or 18 in. long.

The M'Xosa boys, as is the case with other races, elect a chief, generally the son of a man of some importance in the district. All of them are operated on, on the same day, the chief selected being circumcised second, so that should there be any accident at first it will not be he who dies.

After the operation, which is performed with an assegai, the penis is dressed with leaves, which are changed daily.

The foreskin after removal is buried in an ant heap.[1] On the first occasion that the boy has priapism after being circumcised he goes and thrashes the place where his foreskin has been buried. The origin of this custom is difficult to understand.

The patient is painted with some white mixture, made of clay. This practice of painting the boy while he is in the circumcision camp is of interest, as we find that in Baldwin Spencer and F. J. Gillen's work, "The Native Tribes of Central Australia," it is stated that during the Australian initiation ceremonies the boys are painted, their bodies are rubbed all over with grease and are then decorated with pinkish-white clay and birds' down. He then has to wear a very heavy kilt, and a mask made of ferns obtained from near the seashore. As soon as the boys are healed their sweethearts are allowed to join them, sexual excesses are permitted, and they have to commence a series of dances in the districts, which last for about six months, with the idea of making the boys physically strong. While dancing the boys are accompanied by girls, who beat drums made of bullock skins, and sing songs specially composed and reserved for this ceremony, some of which, but not all, are indecent.

The day the boys first leave the camp is an im-

[1] Abstracted from the *Medical Journal of South Africa*, April, 1915.

[2] The calf is kept for the purpose of inducing the cow to give her milk. Many South African cows will not give their milk unless the calf has first sucked. Much the same thing occurs, or did occur, in the Highlands of Scotland. Should the calf die, its skin was stuffed with straw, and used as a substitute. This stuffed skin is known as "tulchane" or "tulchin."

[1] Among the ancient Hebrews the foreskin was either buried or burnt. However, among modern Hebrews it is often preserved.

portant one, and it is considered an honour for the boys to go to a person's kraal to dance. They generally select a wealthy man's kraal, where they know they can get a beast killed for them, and plenty of kaffir beer.

They dance every day, but return each night to their camps, and, though they are not supposed to do so, they spend a lot of time hunting buck and birds.

When the period of dancing is over, the hut and all the boys' clothing are burnt, for everything must be destroyed. Kidd says: "Everything they possess is piled in a heap, taking care to include every shred of bandage or material used during the two or three months, and the whole set on fire, lest some enemy should get possession of anything connected with the rite. If a magician can get possession of any article used by the boys during the period of isolation there is no limit to the evil he may work."

The day their clothing is burnt they have at daybreak to race, quite naked, to the nearest water and wash off the white clay.

While running to the water they must be careful not to look back at the camp. After washing off the clay they go naked to the kraal of the chief boy, generally the kraal of the boy's father, where they receive their fresh clothing. A big feast is provided, and the councillors and principal men give them advice. It is explained to them that they are now men, and must act as such: they must not do "boyish things"; they must fight for their people; see that they have plenty of food; must never give their backs to their enemies, and must never be without an assegai and knife in their huts, &c.

At this time they change their names in the same way as described among the east coast natives. Kidd explains that the natives have two names—one given in infancy, which corresponds to our Christian name, and another which corresponds roughly with our surname. The latter is not given until the child has passed the age of puberty. This name may have a prefix, which indicates his clan, and the fact that it is not given until after puberty shows that a child is not regarded as an organic part of the clan until it reaches adult life. In those tribes in which circumcision is practised at the age of 16 or 17, the second name is given at that ceremony.

Amongst the Zulu people, who, as stated, have abandoned the rite of circumcision, the chief used to call up the boys at about 17 years of age, and publicly give them a second name. But in recent years even this custom has lapsed.

With the M'Xosa natives there are a number of superstitions in connection with the circumcision ceremony. For example, if it is found that a boy's wounds do not heal satisfactorily, it is believed that this is because he has at some previous time been guilty of incest in some form, and it is thought that he will not heal properly until he has confessed to this in full in much the same way that an Arab boy has to confess to the Imam before being operated on.

Among the other African tribes we find practically the same customs observed. For example, Joseph Thompson, speaking of the Wa-taveta, says they have amalgamated their ideas and customs with those of the Masai. Among other things the manner of circumcision proper to the Masai is maintained.

Dr. Copeland, of Mafeking, who for some years practised in Uganda, tells me that the Masai do not remove any portion of the foreskin when they circumcise, but slit the dorsal surface, and through this aperture they force the glans penis, the prepuce consequently remaining an unsightly lump on the under surface.

John Boyes, in his book, "King of the Wa Kikuyi," gives a description of the circumcision rite as practised among the Kikingu. He says on the day fixed for the ceremony the boys all turn out some time before daylight, and are taken down to the river, where they have to stand for half an hour up to the waist in ice-cold water until they are absolutely numb and cold. They are then taken out, led to the operator, who almost completely severs the foreskin with two cuts of his knife, then folds the severed portion back, and secures it on the under surface with a thorn driven through the flesh. The boy then returns to the village and rests for a few days until the wound is healed. No boy is supposed to utter a sound during the operation, and it is probable that the numbing effect of the icy bath prevents their feeling any or very much pain.

Mr. C. L. Harris, in his report on the Bapedi, gives a description of their circumcision rites, which resemble those of the M'Xosa and other tribes in all the essential points, so we need only mention one or two of them for example.

While in camp the Bapedi boys are beaten three times—the first time to impress the duty of *obedience to the chief;* the second, *that of obedience to their fathers;* and the third, *that on no account shall they obey their mothers.*

Among these people the same contempt for an uncircumcised male is shown as among the M'Xosa. As Mr. Harris says, an uncircumcised man may not have intercourse with a woman, and should he seduce a girl of the kraal, the penalty, in the time of Tulare, was death, and an abortion of the woman was produced.

If we consider briefly the corresponding ceremonies as they obtain among the people in other parts of the world far removed from South Africa, we find the underlying principles are the same.

It is evident that they possess one common origin. The similarities are not confined to the African races; certain prominent features are common in many parts of the world, quite removed from Africa, for example in India.

Hughes describes circumcision as practised among the Mohammedan Indians, which may be of interest for purposes of comparison.

Circumcision as practised by Mohammedans in India is performed in the following manner:—

"A bit of stick is used as a probe and carried round and round between the glans and the prepuce to ascertain the exact extent of the frænum, and that no unnatural adhesions exist.

"The foreskin is then drawn forward and a pair of forceps, consisting of a couple of pieces of split bamboo, 5 or 6 in. long and ¼ in. thick, tied firmly together at one end with a piece of string to the extent of 1 in., is applied from above in an oblique direction, so as to exclude about 1½ in. of the prepuce above and ¾ in. below. The forceps severely grasping the prepuce causes a good deal of pain, but this state of suffering does not continue long, since the next thing to be done is the removal, which is done by one stroke of the razor drawn directly downwards. The hæmorrhage which follows is inconsiderable and easily stopped by the application of burnt rags and ashes."

From a medical point of view the one thing most noticeable in the camp was the cleanliness with which the medicine man operated, and consequently the results obtained were excellent; none of them had enlarged glands, or showed other signs of septic poisoning. The doctor informed me that he always kept patients with gonorrhœa till the last, as he was afraid of using his instruments on others after he had operated on them. Where the man acquired his knowledge it is difficult to say, but he may possibly have been a hospital orderly somewhere, as he asked me for some "medicine" to put in the water before he washed his hands.

Unfortunately, the results elsewhere are not always equally good. From some camps came fearful tales of the after-effects of circumcision. In one district two hundred boys got septic poisoning of some kind or another.

It seems very probable that the septic poisoning would have a debilitating effect on the boys, which would be felt for some months, and that though they might appear to be fairly well, they would break down with any unusual strain.

Of course, no one doubts the benefit of circumcision, when it has been performed cleanly and successfully, but syphilis is occasionally conveyed from one boy to another by the knife of the operator. Deaths from hæmorrhage do occur, but they are exceedingly rare, as the native medicine man has a fairly extensive knowledge of styptics.

While in the circumcision camp the boys belonging to some tribes are subjected, as has already been stated, to great hardships. They wear no clothing, and are made to sleep in the open without blankets, sometimes during severe weather, besides being thrashed unmercifully at intervals. It is quite possible weaklings may die simply from exposure and rough usage.

At all events, there is no doubt that fatal results do occur, possibly more often than is generally supposed, because the natives do not make the knowledge of such fatalities common property. For example, among the Basuto, when a boy dies in a circumcision camp, the matter is not mentioned. Someone comes from the hills where the camp is situated, and without saying anything to the parents of the boy, smashes all the son's pots and drinking vessels. The parents recognize this as a sign that their boy is dead, that they will not see him again, and there the matter ends.

Missionaries are now teaching the natives that baptism takes the place of circumcision, consequently many mission natives are uncircumcised. Such boys, when travelling in the vicinity of a circumcision camp, are very liable to be caught, dragged inside, and operated on against their will, a procedure which one would think renders travelling for the uncircumcised unpleasantly exciting.

As a result of the missionaries setting their face against these rites, the natives have reduced the age in some instances at which the operation is performed, in order that the boys may be circumcised before they can be converted to Christianity.

The rite of circumcision of old times among the natives was a religious ceremony of very great importance, but now it has degenerated to a considerable extent.

A PRELIMINARY REPORT ON SOME FURTHER INVESTIGATIONS ON KALA-AZAR IN THE SUDAN.[1]

By Captain R. G. Archibald.

Royal Army Medical Corps;
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Continued from page 143.

The Method of Transmission.—Since Patton's discovery of the development of the Leishman-Donovan parasite in the bed bug, *Cimex rotundatus*, the view that kala-azar is a disease transmitted by some biting insect has been more or less generally accepted. Basile's experiments with the dog flea, *Ctenocephalus canis*, and the domestic flea, *Pulex irritans*, also lend additional support to this view, but confirmatory evidence is still wanting to definitely prove whether infection in man occurs in this way.

As regards the mode of transmission of the disease in the Sudan, one is not convinced that a biting insect plays a part. This statement is based on epidemiological and on a certain amount of experimental evidence.

The following facts do not appear to support the theory that the disease is conveyed by biting insects:—

(1) Sex incidence of the disease. In the Sudan the disease is extremely uncommon among the female population. The customs of the native women would certainly expose them more readily to the attacks of such biting insects as bed bugs, fleas, lice, and mosquitoes, for these are to be found in the dark huts which are usually occupied all day by the female element of the population. Their beds, too,

[1] Abstracted from the *Journal of the Royal Army Medical Corps*, November, 1914.

are usually heavily infested with the bug, *C. lectularius*.

(2) As a rule only a single individual is attacked, the other members of the family occupying the same huts showing no signs of the disease. Such animals as dogs, cats, goats, sheep, hens and pigeons, which are also frequent occupants of these huts, have never been found infected. It is difficult to associate this fact with the theory that the disease is transmitted by a biting insect.

(3) Since the disease has been investigated in the Sudan it has not been found in an epidemic form. This is contrary to what occurs in most diseases transmitted by biting insects.

(4) In experimental researches there has been no evidence to show the existence or development of Leishmania parasites in bed bugs, lice, and fleas fed on cases of kala-azar in the Sudan, and one has failed to transmit the disease to susceptible animals by means of previously fed bed bugs and lice. Marshall also obtained negative results in his transmission experiments with the dog flea, *Ctenocephalus canis*.

(5) The destructive action of human blood serum on cultures of Leishmania. Although the experiments illustrating this point were carried out *in vitro*, they appeared to furnish presumptive evidence against the possibility of the cultural forms of Leishmania living after entering the human host *via* the skin.

(6) Failure to infect a susceptible animal, *L. callitrichus* monkey, by vaccinating it with a heavily infected culture of Leishmania.

As already described, successful results have been obtained by feeding two animals with infected material, and the question naturally arises as to the possibility of such a mode of infection in man.

For practical purposes the question of transmission by food need not be considered, but the probability of water being a means of carrying infection is worthy of study.

Bousfield, Thomson and Marshall found that the disease was more commonly present in villages situated near the river, but a few cases were also found inland in villages which depended on wells during the dry weather for their water supply. Whether the parasite is obtained direct from the water or through some intermediate host, such as a crustacean, is a matter for conjecture.

If kala-azar is a water-borne disease in the Sudan, why is it not more extensive in the endemic areas? As a possible solution one may bring forward the suggestion that in order for infection to occur in man some lesion in the intestinal tract must be present, such as is produced by an intestinal parasite or an entamœba.

Recently one has been carrying out a few examinations of a species of cyclops taken in the vicinity of Khartoum and found some interesting protozoal flagellates in their intestinal tract.

From observations already made one is inclined to consider the possibility of these water crustaceans being intermediate hosts for such protozoa as Entamœbæ and Trichomonas.

These views regarding the transmission of the disease are not quite in accordance with those of many other investigators, but they are at least based on observations recently made, and appear to justify the carrying out of further researches on different lines than has hitherto been done.

No natural host has been found among the numerous animals that have been examined. These include dogs, sheep, goats, chickens and cats. Last year when visiting infected centres particular attention was paid to the dog, but in spite of numerous *post-mortem* examinations of the spleen, liver, bone-marrow and nares no evidence of Leishmaniasis was found. Many of these animals looked ill and emaciated, but in almost every instance they were found to be suffering from piroplasmosis, and many also showed microfilarial infections. Whether *Piroplasma canis* confers an immunity against kala-azar or can occur as a concomitant infection has yet to be proved. Certainly the evidence up to date shows that the dog in the Sudan is not very susceptible to experimental infections, and therefore less likely to a natural one.

Among other animals that one examined with negative results may be mentioned the following: Squirrels, lizards, pigeons, bats, guinea-fowls, crocodiles, hyena, and various species of gazelle.

The main points in this paper may be briefly summarized:—

(1) Kala-azar infections were produced by intraperitoneal inoculations in the following animals: Grey monkey, pup, jerboa, and gerbil, while guinea-pigs, rabbits, cats, kittens, pigeons and a cheetah failed to show infection.

(2) Experiments carried out with cultures of *Leishmania donovani* tend to show that the flagellates are possessed of considerable vitality, and when exposed to unfavourable conditions short of immediate death revert to a cystic stage.

(3) Human blood serum has an almost immediate destructive effect on cultures of *Leishmania donovani*.

(4) Specific agglutinins are not present in the serum of patients suffering from kala-azar.

(5) Kala-azar may occur as a concomitant infection with filariasis.

(6) Intraperitoneal inoculations with cultures produced infection in the grey monkey and the jerboa, but failed to produce infection in white mice, a pup, a wild cat, a guinea-pig and a domestic cat.

(7) A susceptible animal fed with the fæces of a case of kala-azar failed to contract infection.

(8) Infection was established on two different occasions by feeding grey monkeys with infected material containing kala-azar parasites.

(9) Cultures introduced *in vaginam* of a healthy female monkey failed to produce the disease.

(10) Vaccinations with cultures failed to produce infection in a grey monkey.

(11) Epidemiological and experimental evidence does not support the theory that kala-azar in the Sudan is transmitted by a biting insect. A more probable source of infection appears to be some intermediate host whose habitat is in water.

(12) No natural host has been found among the numerous animals examined in the Sudan.

Meetings of Societies.

THE MEDICAL SOCIETY OF THE STATE OF NEW YORK.[1]

INFANT FEEDING.

DR. VAN DER BOGERT had studied 200 cases of children who were ill in respect to their dietetic history during infancy and later during childhood. Of this number seventy-seven, or 38·12 per cent., had been nursed for one year or longer; of these seventy-seven, sixty-six showed symptoms of chronic indigestion and forty gave evidence of toxæmia, including perverted digestion, disturbance of sleep, functional nervous disorders, and chorea. There was some connection between growth and recurrence of adenoids and a bad dietetic history, and it was suggested that prolonged nursing was a factor in the production of adenoids. Of sixty cases having adenoids, twenty-four, or 40 per cent., were prolonged nursers. Of fifty-five cases of urinary incontinence, seventeen, or 31 per cent., had been nursed one year or longer. Prolonged nursing meant, as a rule, carbohydrate excess, since the nursing was usually in addition to other food, between meals and at night. More than 50 per cent. of the cases showed gross dietetic errors. These dietetic errors might be in the direction of proteid excess, fat excess, or carbohydrate excess, though the latter was by far the most frequent. Proteid excess was rare, there being only two cases that could be considered excessive meat eaters and only two that consumed excessive quantities of milk. A study of the series with reference to indican in the urine made it safe to conclude that the presence of even large amounts of indican were not indicative of any specific dietetic excess, but rather of a general dietetic disturbance. The excess of indican seemed to originate in the decomposition of proteid matter, and the condition seemed to be proteid intolerance brought about by intestinal catarrh rather than proteid excess. Certain skin lesions, such as urticaria and eczema, seemed to be associated with indicanuria. The results of the ingestion of large quantities of fat were more evident in infancy than in later childhood, when they were manifested by such conditions as acidosis, recurrent cyclic vomiting, recurrent bronchitis, and the effects of excess directly upon the digestive tract. The writer considered somewhat at length the carbohydrate excesses and emphasized especially the difficulty of controlling them. The invariable history of gross dietetic errors in association with adenoids and enlarged tonsils could not be disregarded; of sixty adenoid cases, over 58 per cent. gave such a history. Urinary incontinence was also frequently associated with carbohydrate excess; thirty-eight out of fifty-five, or 69 per cent., of the cases of enuresis gave a history of having consumed large quantities of sugar and starch. Indican was present in only thirteen out of fifty-five cases of enuresis. Of ten cases of enuresis in which the stools were examined, eight showed undigested starch. The exudative and lymphatic diathesis, though no doubt to a certain extent congenital, were undoubtedly due to the inability of the body to utilize necessary elements of food and were dependent on faulty metabolism. In his experience fatal cases of scarlet fever and measles were almost without exception badly fed. Diet was a great factor in the outcome of whooping-cough and the practice of feeding immediately after vomiting occurred was a bad one. A more careful study of the dietetic history of children coming under attention showed that in dietetic errors lay the cause of many of the disorders of childhood as well as those of infancy.

Dr. T. S. Southworth said that with reference to prolonged nursing as a cause of adenoids, there was an absence of adenoids among the Apache Indians, and that this was because they nursed their babies so long; no doubt this was a factor in the proper development of the nose, teeth, and upper jaw. In older children too much milk might work a distinct injury, and it might be beneficial to give skimmed milk or to omit the milk entirely. Meat is a cause of infection and indicanuria, which latter was indicative of other disordered processes and not always due directly to an excess of meat. Doing away with egg in diet gave good results.

While remote effects of bad feeding might be due to an excess of one food element, or to an excessive amount of all elements, it was a good plan in making a diagnosis to try each article of diet and to find which one was badly tolerated by the child; this might be some trouble, but it gave a line upon which to work and to benefit the child.

Soy Bean in Infant Feeding.

Dr. J. F. Sinclair first employed the soy bean, because of its high protein and fat content, as a weak gruel to replace barley water, tea, and other liquids in gastro-intestinal disturbances in an effort to check the losses in weight which occurred so frequently. In this it had proved most efficient. He had used the bean in seventy-four cases. All the babies were under 3 years of age and were ill with summer diarrhœa. Thirty-four were diagnosed as gastro-enteritis, twenty-eight enteritis, and twelve ileocolitis. In twenty-eight cases the condition of the patient on admission was noted as "bad" or "dying," while in thirty-six it was recorded as "fair" or "good." In this series of seventy-four cases there were nineteen deaths, eleven cases unimproved, and forty-four babies did well. Some of the babies gained, as evidenced by improvement in their general condition, character of their stools, and increase in weight. Twenty-eight of the forty-four cases gained in weight while in the hospital. Of the eleven cases that showed no improvement all but two were fed too short a time to permit of the drawing of a satisfactory conclusion. In no instance had any bad result been noted from the use of the soy bean. Their experience with the soy bean and a careful study of their cases led them unhesitatingly to urge its use-

[1] Abstracted from the *Medical Record*, May 15, 1915.

fulness in the treatment of summer diarrhœa, in various intestinal disturbances, and in marasmus. It was well borne, readily digested, and by reason of its fat and protein content furnished the necessary pabulum to nourish the sick infant.

Dr. Carl G. Leo-Wolf had used soy bean in about 100 cases in private and dispensary practice where one was likely to get better results than in hospital work. In some cases in which the infants were getting proper mixtures, but the limit of starch tolerance had been reached, he had given soy bean with good results. Another use to which they had put this food was to give it to nursing mothers; used in this way it had been a great boon to poor mothers during the past winter. In the soy bean they had food that had a great future and would be a great help in infant feeding.

Nuts and Fruits: their Value in the Diet of Children.

Dr. G. D. Scott said that among the laity there was a firm conviction that nuts gave rise to indigestion and fruits caused hyperacidity. To some the knowledge that nuts were highly nutritious was new. Nuts, however, contained water, protein, fat, sugar, starch, crude fibre, and ash in large proportions. Each kind of nut had its particular value. Dry nuts were very high in nutritive value and contained more fat than any vegetable substance known. In nutritive value nut butters were far above ordinary cream butter. He had given nuts to children as a substitute for meat because of the nutritive value in intestinal fermentation. The discomfort of eating nuts was due to faulty mastication and to the erroneous habit of giving them to children after a hearty meal, between meals, or late at night, whereas they should form an integral part of the meal. Probably nut protein was not as easily digested as meat protein on account of the water content of 3 to 5 per cent. in nuts against 50 to 70 per cent. in meats. It was, therefore, fair to assume that the finer nuts were divided, chopped and mashed, the more rapid would be their digestibility. Salt did not make nut food more digestible. Mothers should understand the food value of nuts better, giving a variety of nuts to suit the individual child, but it must be understood that they were given as an addition to the diet. After weaning the child, nut butter should be cautiously given. Such butters should be more carefully prepared than those for older children. The nut kernels were pounded in a nut mill until of a thick, creamy consistency, and strained through two layers of clean boiled muslin or fine wire sieve. Fruit juice or finely cut or mashed fruit should be added. The stools should then be watched for undigested particles of nuts or any chemical disarrangement as diarrhœa, duodenitis, or enterocolitis. If the butter agreed, the quantity should be gradually increased, care being taken to avoid overtaxing the child's stomach or digestive capacity. In the constipation of infants, nuts formed a valuable aid as a lubricant on account of their oils, but they acted as irritants because of the large amount of refuse which they left. Fruits were given to infants because they were palatable, refreshing, nutritive, and because of their salts, their diuretic, laxative, tonic and antiscorbutic action. In scurvy and other digestive conditions, the fruit juices were almost a panacea on account of their antiscorbutic qualities. In conclusion, the nutritive qualities of fruits and nuts were not to be deprecated; the foods were not to be given to the child as a pleasurable and luscious appetizer only, but as a food in addition to the general diet, stimulating, nourishing, and exhilarating it to a stronger mental and physical existence.

Can Pneumonia in Children be Aborted?

Dr. T. W. Clarke said that pneumonia remained to-day as it was in the Middle Ages, a self-limited fever which must run its course. In the present state of our knowledge one was justified in following any signpost which might seem to indicate a possible road to a specific medication of pneumonia. It was for this reason that he related his experience during the past two years, which, though suggestive, was not convincing. He was called to see a case of pneumonia in a child where masterly inactivity was indicated, but where he knew a placebo must be given. Having some hexamethylenamine with him he decided that this would be as good as anything, and it might have some beneficial influence by excreting into the alveoli. He left a mixture containing 2 gr. to the drachm, a teaspoonful to be administered every two hours. The results were astonishing, and he determined to try this agent again. During the past two years in every case of lobar-pneumonia or broncho-pneumonia he had pushed this agent to the limit and with but one exception the results had been gratifying. In every one of the thirty odd cases of pneumonia in children in which he had used this drug, the temperature had begun to drop within a few hours and in from twenty-four to forty-eight hours the patient was well. His experience had convinced him that the use of this drug early in the disease had in a number of instances shortened the attack.

Dr. J. L. Morse said he believed that hexamethylenamine was inert, that it did not possess any activity unless broken up by an acid. If the reaction in the lung was acid it might do good; but in his opinion the reaction in the lung would not be strong enough to have any beneficial effect.

Dr. John Pryor did not think this agent was of value except in the urinary tract and that perhaps its value there had been over-estimated; whatever action it had was dependent upon an acid medium. To have any action in the lungs more acid would have to be present than could by any possibility be there.

Dr. Southworth believed they would have to consider whether it was really an established fact that hexamethylenamine could be split up only in an acid medium; of course, if that fact were absolutely proved then Dr. Morse's view would hold good. Certain genito-urinary surgeons employed it in an alkaline medium and believed they got good

results. Dr. Clarke's view would, of course, have to be expressed with reserve; there might be doubt as to whether the cases were really pneumonia.

Rollier Treatment of so-called Surgical Tuberculosis.

Dr. J. H. Pryor said that tuberculous lesions by an arbitrary custom when located elsewhere than in the respiratory tract had been grouped and defined quite unreasonably as belonging to the field of surgical tuberculosis, and this led to unnecessary operating or other forms of surgical interference with unsatisfactory or disappointing results. This had directed attention to local rather than constitutional conditions and led to a disregard of common-sense agencies. That there was a genuine need for surgical relief which must be invoked at times was appreciated, but the operation should be superseded or followed by other beneficent influences. The work of Rollier showed that he claimed more than 80 per cent. of recoveries in closed cases and over 70 per cent. in open cases. Rollier had treated during the period 1905-13 1,129 cases. Rollier asserted that 308 of these recoveries were associated with motion of previously affected joints. The important features of Rollier's method were that the insolation was very gradual and slowly completed. The diseased part was kept covered and only exposed to the sun after the coat of tan was existent over the rest of the body. The patient was accustomed to open-air life and sleeping out of doors for about one week. During this period the temperature, pulse, respiration, and the results of urinary and blood examinations were recorded. Preparation for the sun bath included protection from wind and draught. The head was protected by a linen cap or a small awning at the head of the bed. Very gradually, by exposing a small portion of the body at one time, the entire body and finally the diseased part was exposed and tanned as deeply as possible. After each insolation the patient was rubbed with spirits of camphor with a rough glove. Ultimately the insolation was practised four to six hours every day. This treatment was all carried out on a bed to secure convenience and control. Caution must be observed to prevent sunburns and dermatitis. Reactions might occur if the exposure was pushed too rapidly. During the summer the children well tanned could walk and play most of the day unclothed except for a loin cloth. The skin became a bronze hue and then a copper colour and finally a chocolate brown which signified intensive pigmentation. Those who had visited Leysin reported that Rollier's claims were justified and his report of results not exaggerated. The Rollier treatment was first introduced in America at a site 1,650 ft. above sea level with plenty of woods for wind protection. Experiments with this treatment were begun in 1913 with a few patients suffering from tuberculosis of the bones or glands. The buildings were planned for open-air life day and night with protection from and exposure to the sun. The child was naked except for a loin cloth, a cap, and slippers, with stockings in the winter. In the winter time the children were permitted such games as snow-shoeing, toboganning and sleighing. This freedom was only allowed after months of exposure and gradual hardening. The children thus had exercise, games, and open-air schools. They had demonstrated that they could pursue the same methods as Rollier described without any risk or danger in this climate. The exposed children developed marked resistance to cold and its consequences. As the treatment progressed practically every child showed an increase of hæmoglobin and red cells. The climate of Switzerland was not a sunny climate and they had shown that good results could be obtained in localities with somewhat unfavourable weather conditions. The duration of the treatment was long and a large number of tuberculous dependents could not be sent away and were forced to be cared for at home, but the results justified resignation and patience. At the present time sixty-five patients were undergoing treatment in strict accord with Rollier's method. Of these, forty-seven were children under 15 years of age. Ten had pulmonary tuberculosis, but there existed other manifestations, as bone or gland involvement. It had been found that the complications disappeared rapidly under the sun treatment. All the patients at the hospital were improving in various ways which had not been apparent with open-air treatment alone, as was shown by better nutrition, increase in weight, the subsidence of the fever, the return to normal blood count and a subsidence of active inflammatory conditions. Motion returned in cases in which it had been entirely unexpected. The results seemed so remarkable that they justified incredulity until one had seen and was convinced. Thus far Rollier's astonishing statements had been proven true.

Moving pictures were shown of the buildings, the method of applying the treatment, the unclothed children playing in the snow, the open-air school, the outdoor life in many phases.

They were very careful about exposing the children in the winter. They were especially careful to protect them from the wind and from chilling. Perhaps they did not realize how warm the sun was, even in the winter; one of the children was sunburned on February 2, when the pictures were taken. In treating the fistulas and sinuses they used no antiseptic dressing, but simply covered them with gauze so that they had the benefit of the sunlight and air.

Tobacco Cultivation in India is receiving considerable attention. The indigenous leaf of the tobacco plant has not proved suitable hitherto for smoking, either in the form of cigarettes or in pipes. American tobacco plants imported and grown in India have not proved successful commercially. Recently, however, it appears that a type of Indian leaf has been discovered which has the colour and quality likely to prove successful as a cigarette tobacco of high quality.

Original Communications.

FURTHER HISTORIES OF CASES OF TRYPANOSOMIASIS TREATED IN ENGLAND, AND FURTHER CASES.

By C. W. Daniels, M.B.Camb., F.R.C.P.

In 1911 and 1912, I recorded in the *Journal of the London School of Tropical Medicine* such cases of this disease in Europeans as had been under the observation of the staff of the London School of Tropical Medicine, and the further progress of these cases is of interest. The table then published included nineteen cases and of these eleven seemed then to be free from symptoms. They have not all remained so, and I propose in this paper to abandon the grouping according to treatment in the late cases and to group according to the country where the disease was acquired, as it is now clear that the trypanosomes infecting men belong to different strains, if not to distinct species.

Of the first five, before atoxyl was introduced, four were from the Congo and Uganda, and one from the Gambia. Two had recovered, and are still in good health, thirteen years or more after the onset, but one is of special importance as the probable date of infection was 1900 to 1901, and she then had severe iridocyclitis, which necessitated the removal of one eye. Since then, though she has been free both from symptoms and also from parasites and was treated with atoxyl, and for the last three years has been resident in Canada, she has had iridocystitis of the remaining eye, and as there has been no chance of recent re-infection, suspicion is aroused that in this disease late manifestations corresponding to the para-syphilides may occur.

Of the next five cases, treatment was by atoxyl. Four from Uganda, the Congo, &c., recovered and have been in good health for seven years or more, whilst one died of pneumonia one and a half years after the date of infection. Of the four, three remain in good health, but one, E. G. (10), died with nerve symptoms of a rather indefinite character, after having been free from parasites and symptoms for eighteen months. The fatal illness followed diving, but was not definitely diver's paralysis.

The total period after the date of infection is longer than is usual in these infections, and here again the question of the final change being a para type has to be faced.

The full table up to date, divided according to the district from which the three main types of human trypanosomiasis have been described, viz., *Trypanosoma gambiense*, *T. rhodesiense*, and *T. nigeriense*, and which have been under treatment, is here given. It should, however, be noted that because a person has acquired the disease in Nigeria, it does not follow that he is not infected with *T. gambiense*, as that parasite is the common one on the West Coast of Africa, and is the one which has extended both up the Congo and throughout Uganda. I group the Nigerian separately, as some of them may belong to the strain described as *T. nigeriense*.

In addition there are one or two cases, as, for instance, one of the Belgians from the Congo who had had the disease, but where the diagnosis has not been confirmed in England, whose further condition is as yet uncertain.

On these twenty-nine cases we can exclude the six Rhodesian cases, as every one died, and all but one within less than one year after infection, though arsenic and antimony in various forms were freely administered. One lived three years, and during most of that time the disease was under control, and therefore even in this infection there are possibilities.

Of the remaining twenty-three, I propose to consider infections during and before 1909. Of these there are twelve infected with *T. gambiense* from various parts of Tropical Africa, and two from Nigeria who died from intercurrent disease. Of the twelve, nine are in good general health, but one of these who had iridocyclitis in the first few years of infection has had a severe recurrence in late years, but without any other signs of the disease.

Three died, two before treatment with atoxyl was known, of sleeping sickness, and one who had been free from parasites and from any signs of infection for over a year with nerve symptoms after a short return to his old work as a diver. (?) Sleeping sickness.

Of the eight Nigerian cases, two died from intercurrent disease—influenza followed by pneumonia and septicæmia with ulcerative endocarditis—in both these, at the most, the trypanosome infection can only have diminished resistance and increased the liability to disease.

One other infected in 1910 after remaining in good health for nearly two years and doing another tour in West Africa died with symptoms suggestive of sleeping sickness. Whether this points to the establishment of visceral changes which persist after extirpation of parasites and do not yield to anti-trypanocidal treatment must be considered. In the late stage, atoxyl had no effect, and it was over a year before the trypanosomes were found, and then treatment for the first four months was by antimony only, after which trypanosomes were again found.

The possibility of late or para effects in this disease as in syphilis will have to be faced and the analogies of the late stage of the one—sleeping sickness and iritis—with the late stages of the other—general paralysis of the insane and eye lesions, &c. —renders this possibility more probable.

The purely toxic effects shown by the temperature, rash, and irregular cardiac effects, are most marked in the early stages, and in the Rhodesian strain in man, and in all strains in the lower animals these are often fatal. The orchitis and iritis may be either early or late.

It is obvious that the earlier the disease is

controlled and the more completely it is controlled, the smaller the chances of permanent visceral lesions developing, as well as obviating the toxic effects. Early diagnosis is, therefore, essential. Parasites in many infections are so scanty that unless the condition is suspected, the frequent prolonged examinations of the blood necessary will not be made, so that all signs and symptoms that arouse suspicion are important. Continued irregular fever, not yielding to quinine, is one of these, and it has led to the detection in the blood of the parasites. The rash, if present, is a marked feature, and has led to the requisite prolonged examination in several cases, but sometimes, as in (22), not till the patient has been under observation off and on for months, and in others does not appear till late in the course of the disease. Enlargement of the glands, particularly the cervical glands, is enough to cause suspicion, and in some cases the fluid obtained by gland puncture will show the parasites more readily than by examination of the blood. A sign only present in some cases is some form of iridocyclitis.

Cases infected with T. Gambiense.

1. H. K. The type case died in Liverpool after, probably, $1\frac{2}{3}$ years' illness

	Probable date of onset of symptoms	Trypanosomes found	Ocular changes noted	Latest reports	Result	Duration of disease. Years
2. Mrs. M.	1900-1901	July, 1902	Both eyes—the second after an interval of fourteen years	Fair health	Recovery	14
3. Mrs. S.	1901	October, 1902	Nil	—	Death S.S. Nov., 1903	$2\frac{1}{4}$
4. J. M.	June, 1902	March, 1903	Nil	—	Death S.S. 1906	4
5. Mrs. G.	—	1902	—	—	Recovery	12
6. Z.	—	July, 1905	Choroiditis	Fair health	Recovery	10
7. Mrs. R	June, 1905	September, 1905	Nil	Fair health	Recovery	10
8. H.C.C.S.	— 1905	February, 1906	Nil	Fair health	Recovery	10
9. E. J. G. (10 old list)	December, 1907	June, 1908	Iridocyclitis 1909 (?) specific		Death Nov. 3, 1910	
10. C. G.	November, 1906	January, 1907	Nil	Fair health	Recovery — wounded in war	10
11. C. V.	July, 1909	June, 1910	Nil	Fair health	Recovery	6
12. A. P.	July, 1907	July, 1907	Nil	Fair health (no recent information)	Recovery	9
13. Dr. McD.	December, 1909	December, 1909	Nil	Fair health	Recovery	$5\frac{1}{3}$
14. S. S. W.	September, 1914	October, 1914	Nil	Fair health, but trypanosomes were present recently		
15. A. S.	March, 1915	March, 1915	Nil	Fair health		

Rhodesian Cases.

14. W. G.	September, 1909	October, 1909	Nil	—	Died Dec., 1912, convulsions	3
15. H. R. T.	March, 1912	July, 1912	Iritis	—	Died August, 1912, cardiac failure	$\frac{5}{12}$
16. A. C. E.	April, 1912	May, 1912	Iritis	—	Died Sept., 1912	$\frac{5}{12}$
17. H. N. McC.	October, 1913	—	Iritis	—	Died July, 1914	$\frac{10}{12}$
18. Lewis	—	—	—	—	—	
19. G. N. B.	December, 1913	—	Iritis	—	Died June, 1914	$\frac{5}{12}$

Nigerian Cases.

20. W. R. E. (old 9)	September, 1906	January, 1907	Nil	—	Died March, 1908, pneumonia	$1\frac{1}{2}$
21. D. H. L.	August, 1908	(?) August, 1909	Nil	—	Died 1911, septicæmia	$2\frac{10}{12}$
22. C. W. B.	July, 1910	July, 1911	Nil	—	Died May, 1914(?)para	$3\frac{10}{12}$
23. W. H. S.	August, 1913	January, 1914	Iritis	—	Good health	$1\frac{10}{12}$
24. E. C. S.	July, 1913	February, 1914	Iritis	—	Good health	$1\frac{11}{12}$
25. P. A. A.	September, 1913	December, 1914	Iritis	—	Fair health	$1\frac{6}{12}$
26. Dr. J. W. T.	October, 1914	November, 1914	Nil	—	Fair health	$\frac{6}{12}$
27. W.	October, 1914	November, 1914	Nil	—	Fair health	$\frac{6}{12}$

Probably it is more common than the notes indicate, as at first eye troubles were attributed to arsenical treatment rather than to the disease. It was not till the occurrence of iridocyclitis in infected animals yielding promptly to arsenical treatment was demonstrated, that attention was directed to this as a symptom of the disease.

Our notes show one case in the first five, two cases in the next eight. One a peculiar form of choroiditis described by Mr. Treacher Collins, and one possibly due to a nearly certain infection with syphilis. Four out of the six Rhodesian cases have shown it to a marked extent, and three out of the Nigerian cases.

As a rule, in both it is difficult to infect lower animals directly with the parasites, though this is easy in Rhodesian infections, but in one of the Nigerian cases there was no difficulty. No characteristic differences in any form of human infection have been found, but when rats are infected, in a proportion of the trypanosomes, posterior nucleated forms in varying proportion are found, but only in Rhodesian cases. Very small forms are described as the characteristic of the true *T. nigeriense*, but Wenyon finds similar small forms in rats infected from No. 26, though clinically there is nothing to distinguish this case from the others from Nigeria. We yet have no reason to consider that our cases infected in Nigeria, four at least infected on the Benue River, are clinically different or milder than those from other parts of West Africa, and one would be disposed to consider that they were the ordinary infection with *T. gambiense*, but that is the only one in which lower animals were infected: the small forms supposed to be the characteristic of *T. nigeriense* were found in rats.

Whilst the clinical differences, the severity of the symptoms, resistance to treatment and speedy fatal termination from toxæmia are all marked features in cases from Rhodesia, and prove a specially virulent strain or species, nothing yet has been noted in cases from Nigeria that could, on clinical grounds, render any separation justifiable. As regards treatment, for all but the Rhodesian cases, I have been well satisfied with prolonged use of atoxyl or soamin in doses of 3 to 4 gr. alternate days. I prefer also to give antimony at the same time, and in one case slight irregularities in the temperature and in another a persistent orchitis, and in a third recurrence of the rashes, have ceased since antimony also was given. The preparation I use is antiluetin, which can usually be taken in ½ to 1 gr. doses daily without objectionable symptoms. Intra-muscular or subcutaneous injections cause rapid disappearance of trypanosomes, as is the case with tartar emetic or metallic antimony, but though there is no actual tissue necrosis as with those preparations, the injections cause too severe pain for regular use. We are still in want of a satisfactory antimonial preparation or of some other drug in cases where atoxyl is not completely successful or, as in the Rhodesian cases, is a failure.

THE ADMINISTRATION OF EMETINE DURING PREGNANCY AND MENSTRUATION.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.
AND
Dimitri Papatheodorou, M.D.
Khartoum.

So far as we are aware, with the sole exception of a brief reference in the *Indian Medical Gazette*, no one has published the results of the treatment of amœbic dysentery, occurring during pregnancy or menstruation, by emetine hydrochloride.

Pharmacologists like Hale White have drawn attention to the fact that ipecacuanha has a direct effect on the uterus, increasing its contractions, and have issued warnings against its administration in large doses in pregnancy.

Assistant Surgeon Deb, in the *Indian Medical Gazette* of January of this year, however, states that he gave ½ gr. doses of emetine daily for six days to a woman suffering from amœbic dysentery, and in the sixth month of pregnancy, without ill effect.

We, thus, have two directly opposite statements, one by a pharmacologist and the other by a physician, and therefore the following case may be of interest to the practitioner in the Tropics.

We were recently called upon to treat a European lady suffering from amœbic dysentery, and in the third month of pregnancy. Weighing in our minds the two statements given above as to the action of ipecacuanha and emetine on the uterus we decided that the latter drug was not contra-indicated, because it would certainly relieve the dysenteric attack which *per se* might cause a miscarriage.

An injection of 4 cg. of emetine was therefore given intramuscularly to this lady, with the result that sixteen hours later she complained of severe pain on the right side of the pelvis. This pain was increased by pressure, speaking or coughing. As pain and tenesmus from the dysenteric attack were also severe it was decided to give another 4 cg. of emetine, as it was not clear to our minds that the pelvic pain was really uterine.

Three hours after this second injection she complained of strong pains in the uterus and, at rare and irregular intervals, she said that she experienced a peculiar sensation in the lower part of her abdomen, which she compared to the opening and shutting of a hand. As the abdominal wall was thin and lax the uterus could be easily felt, but nothing abnormal was detected.

It was, however, decided to give her repeated small doses of tincture of opium, and later a hypodermic injection of morphine and atropine was administered, but neither of these relieved the pains.

As the amœbæ had disappeared from the motions, and the pains had gradually declined, ceasing entirely thirty-six hours after the first injection, it was decided to give no more emetine.

The lady made a good and quick recovery from her dysentery, and the pregnancy was apparently unaffected, as she is now in her fourth month..

With regard to the action of the drug when given during menstruation we have had a striking example in another lady who was receiving a second course of emetine treatment for amœbiasis from which she was apparently cured. Menstruation appeared during this treatment of ½ gr. doses daily, but suddenly ceased on the second day of the menstrual period after the third injection of the drug and did not reappear, though the injections were stopped. As two subsequent periods were perfectly normal we are forced to the conclusion that the drug in this instance must have been responsible for this sudden cessation of the menstrual period.

It appears to us that a ½ gr. (about 3 cg.) daily dose of emetine is the maximum which can be given safely in pregnancy and that the effect of these doses should be carefully watched and no more of the drug injected than is necessary to kill the amœbæ in the motions, leaving all question of a cure in the sense used by Chalmers and Archibald until after delivery.

With regard to menstruation it would appear to be advisable not to administer the emetine during the period, but if it is urgently required, it can be given without causing serious harm, and can be continued in the inter-menstrual period.

Khartoum.

April 12, 1915.

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Simplified Technique for Intravenous Infusion (Jeger, *Berl. klin. Wochensch.*, lii, No. 9, pp. 201-228).—When there is reason to anticipate that several intravenous injections will have to be made under local anæsthesia, a suitable vein at the elbow is exposed and two ligatures are passed under. It is then cut above the lower ligature, the upper being fastened in position with plaster, and a rubber tube, 20 cm. long, with a silver or aluminum tube in it close to the end, coated inside and out with paraffin to prevent clotting, is slipped into the central stump of the vein of which it thus forms an elongation. A ligature is thrown around the whole, the inner metal tube holding the lumen open. The infusion is then made in the outer end of the rubber tube with a hollow needle. The end of the tube is cut anew each time to bring the syringe into a fresh place on the tube. It is an easy matter to go from patient to patient, when all have their tubes in place, and inject the saline or drug solution as called for. The oftener and the greater the quantity of fluid injected, the longer (four to seven days) the interval before the walls of the vein stick together and impede the injections. It is useful to flush the vein with saline after injecting a drug solution. When the injections are no longer needed, the cannula is removed and the upper ligature is tied round the central end of the vein.

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JULY 15, 1915.

THE SPIRIT OF MEDICINE.

OUR readers, having a knowledge of medicine in every climate, are in an unrivalled position to appreciate the spirit of medicine as it has existed through the ages. The essential principle of every oath taken on initiation into medicine is, and always has been, to regard only the interest of patients. This principle was contained in the oaths of India, of Greece, of the Middle Ages.

In the twentieth century such oaths are rarely taken, because their purport is so well known that it is unnecessary to direct the attention of the profession to them. Yet the necessity still exists more than ever to direct the attention of the laity to the principle that the spirit of medicine consists in considering only the good of the patients individually and humanity collectively. For the English-speaking laity with such persistent reiteration confuse this principle by the use of the French word "etiquette"—which after all only means ticket or label. The label of the profession of medicine is "benefactors of their fellow-men." Where the laity err and are grievously wrong is that they confuse main principles with minor details. They can see the apparent callousness in China of putting a cordon round the town of Mukden to prevent the spread of plague, with the result that all inside died, about 80,000, but they do not bear in their recollection that to have done otherwise would have resulted in the death of millions—as occurred elsewhere.

But, though it is impossible to disregard the errors of the laity, it is more profitable to consider how to counteract their evil results. In other words, to consider what more can be done to benefit humanity. That is, what are the mistakes made by the medical profession? Shortly it may be said that the profession confuses the spirit of medicine by the consideration of minor details and ill-considered facts. Whatever journal is read, or whatever meeting attended, trivialities predominate.

A writer of an article or a reader of a paper puts forward a considered opinion; it receives the most superficial attention, if any. The reader or hearer considers first of all if the author is a friend or a friend of a friend. If he is not, then the article or paper is ignored or but slightly considered. But, if a friend, then the views are accepted, or at all events are not refuted, or their mistakes exposed. Whereas they might concentrate their attention upon what is wrong and expose it, or commend what is good.

Estimation of real worth is obsessed by likes, dislikes and complexities of thought, so that progress is hindered, and ideas clash until only a world upheaval can start new trains of thought, with science and medicine as the international bond of union. For this end to be obtained many changes must be made in medical education, to create a more rapid diffusion of knowledge.

By force of circumstances, those who practise medicine have to consider carefully facts and opinions from all over the world, which means an increased knowledge of living languages to enable essential facts, not abstruse ideas, to be studied, considered and utilized.

It is little wonder that the missionary spirit of medicine, being unconfined by country or climate, comes in conflict with other professions, as law and religion. There is one guiding spirit of medicine throughout the world, but as for laws there are infinite varieties: there are the laws of England, of Scotland, and of Holland, founded on Roman law, elsewhere the code Napoleon.

Fortunately, those who treat tropical patients are but slightly brought into contact with the antagonism between the mental attitude of others with regard to medicine, they are seldom in conflict with lawyers, or those of other professions who are unacquainted with the true inwardness of the medical spirit. The opinions of antis, of antivaccinationists and anti-vivisectionists, only fill them with wonder, as the vagaries of the mentally blind, who cannot inform their minds of facts. Yet to an even greater extent than in cooler climates is it incumbent on them to explain to an ever-changing laity the importance and cash value of human life. Tropical residents know that only too well, for it is ever present in their minds that at any moment their own lives may be cut short. The never ceasing call on the profession in the Tropics is to instruct the laity to co-operate in saving life. All tropical practitioners are faced with a double duty, first, of preventing diseases, which kill their thousands, such as malaria, plague, cholera, dysentery, beriberi, kala-azar, leprosy; in all there have been incalculable results, though much remains to be done, as in leprosy, which has come down through the ages, having much yet to be discovered before it can disappear for ever.

Secondly, there is the treatment of individual patients when many risks are faced, dangers and sufferings incurred which should fill even the most callous anti-vivisectionists with feelings, if they have any, of admiration. There is no more striking figure than the titled physician leper, whose last expressed wish was to return to the scene of his former work to relieve others by the knowledge attained by his own sufferings.

As generations pass others arise, actuated by the same spirit that elevates the aims and lives of the soldiers in the great army of science, so well described by the poet laureate of medicine, Oliver Wendell Holmes:—

> "As Life's unending column pours,
> Two marshalled hosts are seen—
> Two armies on the trampled shores
> That Death flows black between.
>
> "One marches to the drum-beat's roll,
> The wide-mouth clarion's bray,
> And bears upon a crimson scroll,
> 'Our glory is to slay.'
>
> "One moves in silence by the stream,
> With sad yet watchful eyes,
> Calm as the patient planet's gleam
> That walks the clouded skies.
>
> "Along its front no sabres shine,
> No blood-red pennons wave;
> Its banner bears the single line,
> 'Our duty is to save.'"

Abstracts.

HISTORY OF THE TYPHOID CARRIER H. O.*

By Wilbur A. Sawyer, M.D.

The sailor, H. O., was in hospital with typhoid fever from November 15, 1907, to January 15, 1908. During a period of four years, from March 6, 1908, to March 19, 1912, he worked on several steamships, but most of the time on the *Acme*. During this period he infected twenty-seven officers and sailors with typhoid fever. Four of them died. An investigation into the cases on the *Acme* brought H. O. under suspicion as a carrier and the source of the infection. He was studied in hospital for a period of two weeks in December, 1911, but typhoid bacilli were not found by the city bacteriologist in a series of examinations of his fæces, undoubtedly owing to intermittence in the discharge of the bacilli in detectable numbers.

Later gathered circumstantial evidence pointed to H. O. as a carrier responsible for the cases, and a specimen of fæces obtained March 3, 1912, was found to contain many typhoid bacilli. H. O. did not handle or serve food on shipboard, and it is probable that the infection was transmitted to his comrades in various ways, but chiefly through the water in a cask from which the men dipped drinking water.

Since March 19, 1912, except for a short period of parole, H. O. has remained voluntarily in hospital. Every effort has been made by the staff of the hospital to free him from the carrier state.

Between March 28 and October 14, 1912, specimens of fæces were examined weekly and biweekly. The typhoid bacillus was isolated twelve times, but not later than June 19. Examinations of the urine consistently give negative results.

In an attempt to cure H. O., an autogenous typhoid vaccine was administered between April 27 and June 28, 1912, in ten doses increasing from 25,000,000 to 1,500,000,000 bacilli. As typhoid bacilli could not be found in the stools from June 19 to October 14, a period of nearly four months, it was suspected that the treatment had resulted in a cure, but final conclusion was held in reserve pending more prolonged observation.

Persons infected during the Patient's Parole.

When the long series of examinations of the fæces of H. O. had failed to reveal typhoid bacilli, it was agreed that it would be safe to release him temporarily from quarantine. He was discharged from hospital October 14, 1912. He signed an agreement to report for examination once a month for six months. It was understood that this provisional release from quarantine would be made permanent at the end of that time if his condition remained satisfactory. He reported according to the agreement, and examination of his fæces continued to give negative findings. He was employed from October 20, 1912, to about January 10, 1913, as winch driver on the steamer *Noyo* of the coastwise lumber trade.

November 15, 1912, a seaman, O. H., from the *Noyo* was admitted to hospital for typhoid fever. He recovered and left the hospital January 14, 1913.

Another seaman from the *Noyo*, F. C., was admitted to the same hospital for typhoid fever, December 23, 1912. He had a severe and typical attack. The Widal test was positive. He died December 28.

January 9, 1913, a sailor, L. K., ill with typhoid fever, entered hospital. He had been on the *Noyo* from December 16 to 24, 1912, and in all probability had been infected between those dates. The diagnosis was confirmed by a positive Widal test. This patient recovered.

It seemed highly probable that these three sailors had received their infection from H. O. while working with him on the *Noyo*, a ship previously free from typhoid fever. The captain and crew of the *Noyo*, knowing about the experience on the *Acme*, suspected that this was the case. As a result H. O. was discharged about January 10, 1913, and the seamen's union asked the hospital to make an investigation.

The investigation showed that the conditions on the *Noyo* were favourable for the transference of typhoid fever from a carrier among the crew to the other sailors. The men secured their drinking water from a dilapidated water tank having a common drinking cup tied to it. In using the cup the hand was partially immersed, and pollution of the water in the tank was inevitable. Moreover, this tank was situated near the water-closet, which was in an unclean condition at the time of the inspection. The investigators suspected that H. O. was the source of the infection, and recommended that he be again placed in quarantine at the hospital, and that the nature of the water containers used on coastwise vessels entering the port of San Francisco be called to the attention of the State Board of Health. The investigators expressed the opinion that a tight container for drinking water with a faucet would greatly lessen the chances of infection if a carrier were aboard, and that the arrangement exemplified on the *Noyo* was a constant menace to sailors. The conditions for transfer of infection on the *Noyo* were very similar to those found earlier on the *Acme*. The open water-cask of the latter vessel had furnished an obvious opportunity for the transfer of infection.

The series of typhoid cases on the *Noyo* stopped when H. O. was discharged, just as the long series on the *Acme* had abruptly terminated when he left that ship.

January 17, 1913, H. O. was readmitted to hospital in San Francisco, and was again placed under quarantine by the State Board of Health. During the three months of his parole he had infected three persons, one of whom had died.

* Abstracted from the *Journal of the American Medical Association*, June 19, 1915.

Removal of Gall-bladder.

Examination of the fæces of H. O., December 27, 1912, and January 23 and February 6, 1913, failed to reveal the typhoid bacillus, but it was present in a specimen obtained January 28. This positive specimen proved that the patient was still a typhoid carrier, a conclusion already reached on account of the infections on the *Noyo*.

At that time the existing literature gave considerable assurance that chronic carriers discharging typhoid bacilli in their fæces usually owed their condition to a diseased gall-bladder, and that its extirpation would result in a cure. After mature consideration removal of the gall-bladder was recommended, and H. O., anxious to be freed from the danger of harming others, consented to be operated on. February 12, 1913, the gall-bladder and its duct were removed. H. O. rapidly regained his usual good health.

The gall-bladder, contrary to expectations, contained no gall-stones and was normal. A painstaking bacteriological examination in San Francisco showed that the contents of the gall-bladder did not contain typhoid bacilli, although colon bacilli and a few other organisms were present. In this carrier the gall-bladder was not the focus at which the intermittent infection of the intestinal contents originated. It may, nevertheless, have been a place favourable to the multiplication of typhoid bacilli received in the bile from a focus in the liver, if such a focus existed.

After the operation frequent examinations of the fæces of H. O. were made. Nine examinations from March 4 to April 1 were negative. April 8, 1913, a specimen was obtained from which the typhoid bacillus was isolated. The removal of the gall-bladder, like the treatment with typhoid vaccine, had failed to cure the carrier state. In necropsies it has been shown a number of times that the gall-bladder of a typhoid carrier may be free from typhoid bacilli. In five out of twenty-two thorough necropsies on chronic typhoid carriers the typhoid bacillus was not present in the gall-bladder. In the series of twenty-two cases the typhoid bacillus was not infrequently found in the gall-bladder and in the bile-ducts of the liver, usually in the contents, and sometimes in the walls. In rare instances it was found in the spleen, and in single instances in the bone marrow, lung, and (in the presence of tuberculous lesions) in the supra-renal and kidney.

Later Examinations.

From April 10, 1913, to April 7, 1915, a period of two years, the fæces of H. O. were examined seventy-one times and typhoid bacilli were found in only three specimens, obtained November 28, and December 5, 1913, and February 11, 1914. During the last fourteen months of this period forty-two examinations were made and all gave negative results. In the examinations a suspension of the fæces in broth or sterile water was streaked over the surface of Endo or Drigalski medium, or both. After proper incubation the typhoid-like colonies were studied further by cultural and serologic methods.

Isolation of the Typhoid Bacillus from the Stomach Contents.

When the examinations of fæces had given negative results for over a year, a method suggested by Carnot and Weill-Hallé was used. On two occasions bile was obtained for examination by feeding H. O. 150 c.c. of olive oil on an empty stomach and removing the stomach contents one hour later through a stomach tube. After allowing the stomach contents to stand, the lower layer containing the bile was removed and examined. In the first specimen, obtained January 26, 1915, typhoid bacilli were not found, but an organism was isolated which resembled the paratyphoid A. bacillus. From a second specimen, obtained in the same way, March 16, 1915, the typhoid bacillus was isolated. An examination of the fæces eight days earlier had been negative. The finding of typhoid bacilli in stomach contents containing bile showed that H. O. was still a carrier, March 16, 1915, and suggests that the bacilli may have come with the bile from the liver.

Isolation of the Typhoid Bacillus from Fæces obtained by Purgation.

April 12, 1915, H. O. was given podophyllum in the evening. The following morning magnesium sulphate was administered. During the next twenty-four hours three stools were obtained. The first was firm, like most of the stools from H. O., and the second was soft. Typhoid bacilli could not be found in these two specimens. The third stool was semi-fluid, and Dr. Wayson found that it contained typhoid bacilli in large numbers. During the preceding fourteen months typhoid bacilli had not been found in the fæces of H. O.

When H. O. was being investigated in March, 1912, a semi-fluid stool containing very many typhoid bacilli was obtained after the administration of fluid extract of cascara and magnesium sulphate. It was suspected that active peristalsis increased the number of typhoid bacilli in the fæces by stimulating the flow of infected bile (or other material), or possibly by enabling more of the typhoid bacilli to survive some unfavourable condition in the intestinal contents.

Virulence of the Typhoid Bacillus from H. O.

That the typhoid bacilli from H. O. were highly virulent had been repeatedly shown by severe and fatal cases among the sailors who came in contact with him. Additional evidence was obtained through an accident in the State Hygienic Laboratory. June 15, 1914, an assistant engaged in making an anti-typhoid vaccine attempted to transfer with a pipette a suspension of live typhoid bacilli of the strain originally obtained from the fæces of H. O., March 3, 1912. A small amount of the suspension was drawn against the tip of the

tongue and the teeth. The mouth was at once washed out repeatedly with 50 per cent. alcohol. Nine days later the symptoms of typhoid fever began with headache. The course of the disease was mild and brief. The temperature did not go above 39·6° C. (103·2° F.), and returned to normal on the ninth day of the illness. The Widal test was negative at the onset, but strongly positive later. This accident showed not only that the typhoid culture isolated from H. O. was virulent, but also that a culture which had been grown on nutrient agar for two and a quarter years and transferred at least monthly was still capable of producing typhoid fever in human beings.

Summary and Conclusions.

(1) Although frequent examinations of the fæces of the typhoid carrier H. O. gave negative results for four months after he had been treated with autogenous typhoid vaccine, he infected three persons when subsequently released from quarantine on parole. The total number of persons infected by this carrier is thirty, including five who died.

(2) In a further attempt to cure this carrier the gall-bladder and its duct were removed surgically, but the typhoid bacillus was found in the fæces several times after the operation. Examination of the gall-bladder showed that it was normal, and that its contents were free from typhoid bacilli.

(3) After forty-one successive examinations of fæces during a period of fourteen months, all with negative results, the typhoid bacillus was isolated from stomach contents containing bile.

(4) Certain typhoid carriers are unusually dangerous, and must be controlled by quarantine or other adequate supervision.

ON AN EPIDEMIC OF AFRICAN TICK FEVER AMONG THE TROOPS IN BRITISH SOMALILAND.*

By R. E. Drake-Brockman, M.R.C.S., L.R.C.P.

This disease only appears to have invaded British Somaliland during the last few years, although the transmitting agent, *Ornithodorus savignyi*, has been known to the Somalis for years. The first occasion on which the disease was recognized was during an epidemic in the coast town of Bulhar during 1912. This epidemic was restricted to a small portion of the community in an outlying part of the town where the indigent section of the townspeople had their huts. The town of Bulhar is the coast town to which in the cold season all the western tribes bring their sheep, skin, &c., for sale, and it appears that the fever spread along this route to the next station, namely, Hargeisa, where there is always a permanent collection of huts belonging to the local mullahs or priests. During the past year, 1914, it was found necessary to send a company of the Somaliland Camel Constabulary to Hargeisa to settle some differences among the local tribes, and it so happened that during their short residences there a considerable number of the men of this company contracted the disease.

Notes on Ornithodorus savignyi.

On the examination of the peripheral blood of the patients during the pyrexial attacks the spirochæte was found in nearly every case, and all the men practically admitted that they had been freely bitten by the Kudkuda, the local name for *Ornithodorus savignyi*. On examination of the soil among the huts and in the localities where the natives congregated a large collection of these ticks was made.

In British Somaliland, *O. savignyi* is generally found in the soil, in old-standing camps and zarebas, under the shade of trees where human beings and animals are in the habit of resting during the heat of the day, and in the soil around well-frequented wells—in point of fact, every place freely frequented by both men and animals where the soil is light, powdery and dirty. When resting it will lie up in any cranny or crevice in a wall or tree trunk, but seems to prefer burrowing into the soil, as it is a poor climber. When in quest of its victim, it travels rapidly over the surface of the ground and loses little time before it finds a suitable place to drink its fill. It does not seem to have any special predilection for the blood of human beings, but will with equal avidity feed on that of camels, horses, mules, donkeys, sheep and goats.

The mode of progression of *O. savignyi* varies according to the roughness of the surface over which it is travelling. On a smooth surface it usually proceeds propelling itself by its two pairs of hind legs only, with the front pairs folded round on themselves at rest. As soon, however, as obstacles present themselves, or it wants to burrow in the ground, the two front pairs are also brought into action. When turned over on to its back the legs are all folded up at once and it will lie perfectly still until it is satisfied that all danger is passed, and it will then slowly turn over and attempt to make good its escape. It is sometimes said that Ornithodorus only feeds at night. This is certainly not the case with *O. savignyi* in British Somaliland.

One has only to stand in any place infested by them to find within a few minutes that they are swarming over one's boots, while the natives with their naked feet, and the ponies and other animals will become restless owing to their bites, and will be forced to leave the shade of the trees on their account during the hottest hours of the day.

These ticks are more commonly found under trees which provide ample shade both to men and animals during the heat of the day, and it is here that they usually await their victims. They have, however, a better chance of getting their fill of blood from human beings during the night owing to the habit

* Abstracted from *Transactions of the Society of Tropical Medicine and Hygiene*, June, 1915.

natives have of sleeping on the ground in preference to a bed. In native huts where their blood supply is more certain, they probably more often feed at night, as few Somalis occupy their huts during the daytime, whereas under trees and around wells they have a better chance of obtaining a feed during the daytime.

O. savignyi always lies dormant just below the surface of the soil, and is probably roused to action by the thud imparted to the ground by the steps of men and animals. Within a few minutes of one's arrival the ground in well-infested areas is found to be alive with them and, whether attracted by sight or sound, they will travel rapidly over the ground in the direction of their blood-supplier. Owing to their dusty, wrinkled appearance they are very difficult to see unless in motion. *O. savignyi* will live for months without a feed providing it can burrow in the soil. It usually only burrows just below the surface so that it can rapidly emerge as soon as the ground is disturbed by the foot of man or beast. Even in a bottle well corked, so as to shut off all air, these ticks will live for months, and although appearing to be dead on being turned out, they will, within a minute or two on exposure to the air, begin to show signs of life.

The Spirochæte.

During the first two or three days of the initial rise of temperature the spirochætes may be found in the peripheral circulation in numbers proportionate to the severity of the attack. They are invariably seen on the first day in long, thin, regular corkscrews or straight spirals. Very occasionally these straight spirals are to be seen bent on themselves. Two may be seen lying end to end, so as to give the appearance of one very long spirochæte. Later, on the second or third day, the straight spirals show a tendency to straighten out and curl into loops.

The spirochætes are seldom difficult to find in the peripheral circulation during the initial rise of temperature or in the first relapse, but in the later relapses they require a good deal of looking for, and are frequently not to be found at all.

Clinical Course.

Owing to the patients being unattended by a medical man from the date of their arrival on September 25, in the infected area, until their return to headquarters on October 23, it was difficult to arrive at the period of incubation, but the first to report sick with fever did so on September 30 or October 1.

The period of pyrexia during the initial attack is usually longer than in the relapses. It may last from seventy-two to 120 hours, whereas in the relapses it is more commonly from thirty-six to seventy-two hours, and in some cases may reach ninety-six hours.

In this particular epidemic five or six relapses were the rule, but in no case were there more than six relapses.

The apyrexial periods varied from 120 to 384 hours, in other words, from five to sixteen days, but it more commonly extends from six to nine days, and when it extends longer than this there is not infrequently an abortive attempt at a rise for one evening, with a fall to sub-normal on the following morning.

There are a few cases, but these are happily by no means common, in which the temperature seldom rises above normal, and when it does there is a low irregular type of fever which does not often rise above 101°. Except during epidemics, when there are other well-marked cases, these are not easy to diagnose. In one case, although a man was suspected of having contracted the disease along with others of his company, it was not until his eyes became affected months after that the diagnosis was fairly certain.

Out of a number of cases which were infected, only ten were badly affected, and these were kept under observation until the relapses ceased. Out of these only three had affections of the eyes, while in only one case were both eyes affected. In these four cases there was iritis, with probably slight opacity of the vitreous, as there was almost complete loss of sight in the affected eyes for some days.

The liver and spleen were both slightly enlarged and tender in most of the cases. There was a tendency to constipation as a rule, never diarrhœa.

Myalgic pains in the limbs, and particularly severe in the calves of the legs and back, with severe headache, always accompanied the pyrexial attacks and continued more or less severe during the apyrexial periods, when the patients were debilitated and lethargic and had little inclination to work.

Vomiting occurred in most of the cases but not in all, while herpes only occurred in one case, and epistaxis in two.

In no case did jaundice occur, nor were the lungs attacked in a single instance. The heart in all cases was more or less dilated.

Prognosis.

The prognosis, notwithstanding the severity of the epidemic, was very good, no case of death occurring. The disease, however, from a military point of view, is bad, owing to the length of time which usually must elapse before the patient is at all fit to perform even the lightest duties. In most of the cases the patients were unfit to return to their regular duties for three months.

Diagnosis.

In the initial pyrexial attack the diagnosis can only be settled by the finding of the spirochæte in the blood.

In the first and second relapses they are scarce, and usually difficult to find in the peripheral circulation. In only one patient was the spirochæte found as late as in the fifth relapse. In the

apyrexial periods the spirochætes are never found in the peripheral circulation. The disease might be taken for subtertian malaria in regions where they co-exist, but it can be differentiated by the presence of the spirochæte in the blood and later by the regularity of the relapses.

In those rare cases where there is no rise in temperature, the disease is difficult to diagnose unless there is an epidemic of the disease present, or else after a long period of debility and weakness the patient shows signs of iritis followed by temporary blindness.

PROPHYLAXIS.

Avoid standing about or sitting in the neighbourhood of wells, in bazaars, and tarikas (mullahs' villages), or wherever there is a more or less permanent collection of huts. In places where there are only one or two large spreading trees, under which sheep and goats and human beings rest during the heat of the day, there is always a likelihood of the soil being infested with *O. savignyi*. These ticks do not like being disturbed after feeding, when they burrow into the ground, so they prefer places where filth and rubbish are allowed to accumulate outside towns and villages. In Bulhar, in 1912, I found them in only one quarter of the town, on the outskirts, where the indigent Somalis had erected their huts and shelters.

If a soft tick is touched with a tiny drop of turpentine it will die in thirty seconds or less, so if all the patients suffering from the disease have their legs and feet well rubbed with it they will not be bitten, or rarely so. This is particularly to be recommended when patients suffering from the disease are taken from one locality to another, and so prevent the dissemination of the disease.

METHOD OF DEALING WITH GROUND INFESTED WITH O. SAVIGNYI.

When it has been ascertained that any particular area is infested with soft ticks, the best method of dealing with the site is to light a circular fire round the area and then gradually work towards the centre by throwing brushwood into the circle and systematically burning the whole area. This particularly applies to those sites which, for obvious reasons, cannot be abandoned, such as the immediate neighbourhood of wells, which may be few and far between in dry countries. It has been suggested that the ticks will disappear if the ground is sprayed with corrosive sublimate, but this is not the case, owing to the habit of the tick when not feeding, or in search of its victim, of burrowing from half to one inch below the surface of the soil. Experimenting with a 1 in 1,000 solution of corrosive sublimate I found that if the sand containing a number of these ticks of different sizes is thoroughly soaked with the solution and left, the ticks on the following day will be just as lively as before. Furthermore, a young unfed tick can be immersed in the same solution for one minute without its being affected in any way. If some of the light soil in which these ticks are commonly found is placed in a large glass dish and unfed ticks placed inside and allowed to burrow, the soil can be thoroughly soaked with the solution, and this allowed to dry, when the ticks will be found to be alive and apparently unharmed.

TREATMENT.

Of the various drugs available, the following were tried alone or in combination with no appreciable effect on the course of the disease, namely, quinine, phenacetin, arsenious acid, liq. hydrarg. perchlor., with calomel and magnesium sulphate as purgatives.

FOUR CASES OF BILHARZIASIS UNDER THYMO-BENZOL TREATMENT.*

By C. M. EKINS, M.R.C.S., L.R.C.P.
Director, Alexandria Hospital, Egypt.

Case I.—An Egyptian, aged 23, policeman, admitted to hospital on November 22, 1914, with painful and frequent micturition and hæmaturia. The urine was examined immediately after admission, and living miracidia found.

He was first put on buchu and hyoscyamus, and light diet; subsequently irrigation of the bladder with pot. permang. 1: 4,000 was started, the bowels being kept all the time freely open.

On December 20, he was given the thymo-benzol preparation, 0·20 and 15 grm. respectively, t.d.s., and this he took for a couple of days, during which period he was more or less intoxicated.

The dose was reduced for this reason from 15 grm. to 4 grm. and the patient continued to take 4-grm. doses t.d.s. for six days, and three more searches in the urine on different days proved the persistence of active miracidia. Bowels regular, no alteration of pulse.

Patient discharged on December 31, unimproved.

Case II.—An Egyptian, aged 35, labourer, was admitted on December 16, 1914, with straining at stool with blood and mucus. Stools examined and bilharzia ova found, urine searched and living miracidia also found.

The patient's bowels were first opened by a dose of sod. sulph.; felix mas was then administered internally, and tannin enemata for two days.

On December 19, he was given the thymo-benzol treatment, 0·20 of the former and 15·00 of the latter, four times daily, but symptoms of intoxication supervened. (The patient kept laughing and was full of hallucinations.) This big dose had to be reduced next day to 4 grm. only t.d.s.

Meantime, repeated examinations of the stools and urine proved positive, active miracidia present.

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* Abstracted from the *Transactions of the Society of Tropical Medicine and Hygiene*, June, 1915.

The treatment was continued until December 26, and, one more examination of the fæces and urine proving positive, this case was sent out on January 3, 1915, no better.

Case III.—An Egyptian boy of 12, admitted on December 19, 1914, with symptoms of dysentery; the stools contained the ova and miracidia.

On the 21st and 22nd, small doses of calomel acted well, producing four or five lax motions in the twenty-four hours.

On the 23rd, he was given the thymo-benzol, 0·20 of the former and 3·00 of the latter, t.d.s., which treatment he kept taking for six days, the bowels open all the time. Except that the boy was slightly drowsy, there has been no change worth mentioning.

Result.—Miracidia which were alive on the first examination, were not found on a second examination made on the 24th, and another on the 26th, but in repeating the search on the 28th a few living miracidia were found. The boy was discharged on the 31st, unimproved as far as the bilharzia is concerned.

Case IV.—A policeman of 22, admitted on December 18, with a complaint of passing blood and mucus in his stools. For two days his bowels were opened by 10-grm. doses of sod. sulph. in the morning at the time that his stools were sent to the bacteriologist, who reported absence of bilharzia and presence of ankylostoma ova. The patient was put on the thymol treatment for ankylostomiasis, while tannin enemata were also administered. Bilharzia ova were looked for again next day, but neither they nor amœbæ were found.

Three days later, a further search in the stools still proved absence of bilharzia ova and amœbæ, but revealed existence of trichomonas. Next morning, *i.e.*, on the 24th, bilharzia ova were found, though not one miracidium out of the shell. On the 26th, another examination proved negative to both bilharzia and trichomonas.

Before starting any thymo-benzol treatment the stools were examined once more, on the 28th, this time living miracidia being found; the patient was given six doses of the preparation in two days, 0·30 of the thymol and 3·00 of the benzol. The amount of blood passed per rectum next day was even worse than before, and on further examination living miracidia were again found.

The patient was eventually discharged from the police service.

A year ago Dr. William Robertson, of Natal, sent an extract from a Natal lay paper, and it was published in the *Transactions* in November, 1914. It was stated that it invariably cured the patient, and, curiously enough, the paper said that the patients never suffered from intoxication.

Thymo-benzol has been used in Caracas with very good results by Dr. Gonzalez Rincones in the treatment of bilharziasis, according to the formula of Dr. Robertson. This consists in a mixture of 1 grm. and 8 cg. (1·08) of benzol and of 15 cg. (0·15) of thymol. Some cases have yielded to this treatment.

Annotations.

Digestive Disorders due to War Bread, and their Treatment (Von Noorden, *Berl. klin. Wochenschr.*, April 5, 1915).—On all sides medical men have been listening to complaints of all kinds about the rye-potato war bread. It is true that such complaints have been for the most part silent, *i.e.*, went no farther; still many of them have re-echoed to the present time, and it is very evident that numerous bakeries have not made war bread palatable and digestible. Individuals who have organic diseases of the digestive organs are not included, because at most with them it is a matter of wheat-rye rolls or toasted bread, which are fully equivalent to *ante-bellum* wheat bread. The rye-potato bread tends to set up, in those of sound as well as of weak digestion, diarrhœa—as a result of fermentation which still persists in the fæces. The subjects are naturally heavy eaters of white bread who consume to-day 400 to 500 grm. daily of war bread. Such individuals bolt their food, and all they need is to cut the daily ration in half and masticate thoroughly; as a result of which their troubles rapidly disappear. A few of these sufferers were victims of latent achylia gastrica. The second disorder is hyperacidity of the stomach in subjects with normal secretion under the old *régime*. These cases are due to the unaccustomed food causing the sensitive stomach to secrete an excess of acid. As it is hardly expected that these stomachs will learn to tolerate the new diet, it is best to administer small doses of sodium bicarbonate until war bread is a thing of the past. The third disorder noted is flatulence, by far the most common result of eating war bread. This condition spreads epidemically as if by imitation (mass-suggestion). These individuals, as a rule, have become addicted to the finest kinds of wheat flour products, which require little mastication. Hence, they do not sufficiently chew the coarse rye bread, especially when it is fresh. The chyme, with fragments of bread, cannot be dealt with by the pancreatic amylase. Shreds of bread thus become a culture bed for intestinal flora; while the cellulose itself, so largely present, readily ferments. Nevertheless, tolerance develops in these subjects, which in part explains why original complaints cease. Charcoal is an extremely valuable remedy for this condition used for several weeks in succession in large doses. The fourth disorder from war bread, to wit, constipation, is rare, and due perhaps to other factors, treated by giving foods known as "fæces formers."

Reviews.

Aids to Tropical Medicine (Second Edition). By Gilbert E. Brooke, M.A.Cantab., L.R.C.P. Edin., D.P.H., F.R.G.S. Pp. xii + 230. 37 figures. London: Baillière, Tindall, and Cox, 8, Henrietta Street, Covent Garden. 1915. Price 3s. 6d. net, cloth; 3s. paper.

We have much pleasure in welcoming the second volume of this excellent student's text-book, which has an admirably concise and up-to-date summary of the most important tropical diseases. The alphabetical arrangement of the subject matter much facilitates ready reference, and may be described as almost letter-perfect, although "K" should be "V" -edder. Non-essentials are omitted and theoretical considerations only discussed when necessary for the subject; thus in beriberi, one of the most difficult subjects to consider theoretically, the information cannot be improved upon. The book is a useful addition to the well-known Student Aid Series.

The Elements of Military Hygiene, especially arranged for Officers and Men of the Line. By P. M. Ashburn, Major, Medical Corps, U.S. Army. Pages viii + 351. Houghton Mifflin Company, Boston and New York. 1915. Price $1·50 net.

This book can be thoroughly recommended as an admirably successful attempt to describe the causes and means of prevention of diseases which affect soldiers, especially on campaign and in the Tropics. The men and combatant officers of all ranks will much increase their utility by acquiring a knowledge of the interesting subject of sanitation, so that they can freely and intelligently co-operate in the necessary efforts to promote it.

The book will enable medical officers to appreciate the view of the staff and increase their capacity as teachers and administrators.

The volume is divided into four parts: The Recruit and his Environment; The Causes of Disease; The Prevention and Control of Epidemics. These are the headings of every left-hand page. The Supplement is devoted to the prevention of mental and nervous diseases. The contents of each chapter of the first three parts are indicated on the right-hand pages. The subject matter of important paragraphs is indicated by marginal notes.

A clear and well-considered Index of seven pages much facilitates ready reference.

The first chapter deals with the recruit, a subject of extreme importance, as the early management or mismanagement has a far-reaching effect on permanent efficiency. Personal hygiene is next dealt with, including temperature and climate. Foods and their preparation is a distinctly interesting subject; the paragraphs dealing with salads and desserts and candies strike a sympathetic chord. Barracks, camps, and movements of troops are next discussed.

The second part is divided into predisposing and exciting causes. In considering epidemics the author deals with the defences against diseases in general, and then considers the alimentary and respiratory tracts, followed by insect-borne diseases, in which the most recent views are incorporated, including the river fever of Japan, sand-fly fever of the Balkans, and Chargas' disease in Brazil. A chapter is devoted to venereal diseases, and here the pertinent remark is made that a great number of admissions is made up by a relatively small number of men, the majority of whom are of the less desirable class of soldiers.

The prevention of mental and nervous diseases is a subject almost as easily understood by the laity as by the doctors, for no technical knowledge is necessary in order to appreciate that education exercises a very large influence on the development of nervous diseases.

A Hausa Phrase Book. By Allan C. Parsons, W.R.M.S. Pages iv + 164. London: Humphrey Milford, Oxford University Press. 1915. Price 7s. 6d.

This book fills a distinct gap in Hausa literature, supplementing a grammar and paving the way for a complete dictionary. It is especially useful to beginners, who have become acquainted with the by no means difficult elementary sounds of the language, and serves to illustrate the grammar and syntax. To those who have already a knowledge of the colloquial language it will enable them easily to enlarge their vocabulary. The utility of the book is much increased by the clear and concise way in which the Table of Contents is divided up, and by the heading of each page indicating the subject matter.

The author is to be commended for his modesty in placing the medical phrases last of all. One is justified in saying that every section of the book is equally reliable, and the author has had the courage to avail himself of considerable outside assistance, which he generously acknowledges. The book finishes with vocabularies of English-Hausa and Hausa-English, and several blank pages are added for purposes of note-taking. The paper is light but strong, and no doubt the book can be supplied with rounded corners and leather cover so as to withstand the wear and tear of hard use and travel. It is to be hoped it will be available for officials and others, not only where Hausa is the prevailing language, but also in the wide area where it is occasionally spoken.

Original Communications.

THE METEOROLOGY OF MALARIA.

By Mathew D. O'Connell, M.D.

Below I give the atmospheric conditions in Colon, at the Pacific end of the Panama Canal, for a continuous period of forty-eight hours in the month of August, when malarial fever is prevalent. It may be contended that if such atmospheric conditions cause the fever, then *all* immersed therein must suffer from the disease and none would be immune; whereas, when malarial fever prevails in any locality or community, a large number of the inhabitants do not show any increase of body temperature, they are immune. I will attempt to explain why some should be immune when exposed to atmospheric conditions which raise the body temperature of others.

	Atmospheric conditions at Colon, Panama Canal (Atlantic Side).					Atmospheric conditions which raised body temperature in the weaving and spinning sheds of Lancashire and Ireland				Degrees to which body temperature was raised by exposure in the spinning and weaving sheds		
	Temperature of air, F.		Drying power of air per 10 cubic feet	Velocity of wind per hour		Temperature of air, F.		Drying power of air per 10 cubic feet	Movement of air per hour	Body temperature in mouth, F.	Pulse	Respiration
Colon, 1913	Dry	Wet	Grains	Miles		Dry	Wet	Grains	Miles			
August 1, 1 o'c. a.m. ..	80·0°	77·4°	15·0	10		80·0°	71·0°	44·0		100·0°	90	24
,, 2 ,, ..	—	—	—	14		—	—	—		—	—	—
,, 3 ,, ..	79·0	76·0	16·0	12		79·0	73·5	28·0		100·3	110	24
,, 4 ,, ..	—	—	—	10		—	—	—		—	—	—
,, 5 ,, ..	79·0	76·4	14·0	10		79·0	73·5	28·0		100·3	110	24
,, 6 ,, ..	—	—	—	11		—	—	—		—	—	—
,, 7 ,, ..	82·0	79·0	18·0	12	A	82·0	79·0	18·0		100·8	126	22
,, 8 ,, ..	—	—	—	11		—	—	—		—	—	—
,, 9 ,, ..	85·0	79·7	32·2	10		85·0	77·0	45·0		100·4	120	24
,, 10 ,, ..	—	—	—	10		—	—	—		—	—	—
,, 11 ,, ..	87·0	81·2	41·7	11		87·0	79·0	60·0		100·4	108	24
,, 12 o'c. noon ..	—	—	—	14		—	—	—		—	—	—
,, 1 o'c. p.m. ..	87·0	80·7	46·7	17		87·0	79·0	60·0		100·4	108	24
,, 2 ,, ..	—	—	—	18		—	—	—		—	—	—
,, 3 ,, ..	86·0	80·2	35·6	19		86·0	77·5	49·0		99·2	80	20
,, 4 ,, ..	—	—	—	18		—	—	—		—	—	—
,, 5 ,, ..	84·0	79·5	27·0	18	B	84·0	80·0	24·0		101·0	114	26
,, 6 ,, ..	—	—	—	16		—	—	—		—	—	—
,, 7 ,, ..	82 0	78·8	19·0	15		82·0	79·0	18·0		100·8	126	22
,, 8 ,, ..	—	—	—	12		—	—	—		—	—	—
,, 9 ,, ..	81 0	78·4	15·6	10		81·0	77·0	22·0		100·4	120	24
,, 10 ,, ..	—	—	—	11		—	—	—		—	—	—
,, 11 ,, ..	81·0	78·6	14·4	11		81·0	77·0	22·0		100·4	120	24
,, 12 o'c. midnight	—	—	—	14		—	—	—		—	—	—
August 2, 1 o'c. a.m. ..	81·0	78·6	14·4	13		81·0	77·0	22·0	No movement of air perceptible	100·4	120	24
,, 2 ,, ..	—	—	—	12	A	—	—	—		—	—	—
,, 3 ,, ..	81·0	78·8	13·2	16		81·0	77·0	22·0		100·4	120	24
,, 4 ,, ..	—	—	—	12		—	—	—		—	—	—
,, 5 ,, ..	80·0	77·8	7·0	14		80·0	71·0	44·0		100·0	90	24
,, 6 ,, ..	—	—	—	12		—	—	—		—	—	—
,, 7 ,, ..	82·0	77·8	13·2	13		82·0	77·0	28·0		100·2	80	24
,, 8 ,, ..	—	—	—	15		—	—	—		—	—	—
,, 9 ,, ..	83·0	80·0	18·0	14		83·0	80·0	18·0		100·4	128	24
,, 10 ,, ..	—	—	—	13		—	—	—		—	—	—
,, 11 ,, ..	85·0	81·2	23·8	16		85·0	77·0	45·0		100·4	120	24
,, 12 o'c. noon ..	—	—	—	12	B	—	—	—		—	—	—
,, 1 o'c. p.m. ..	84·0	80·2	23·0	14		84·0	80·2	24·0		101·0	114	26
,, 2 ,, ..	—	—	—	12		—	—	—		—	—	—
,, 3 ,, ..	85·0	81·2	23·8	14		85·0	77·0	45·0		100·4	120	24
,, 4 ,, ..	—	—	—	15		—	—	—		—	—	—
,, 5 ,, ..	82·0	78·6	20·0	10		82·0	78·0	23·0		100·2	80	16
,, 6 ,, ..	—	—	—	12		—	—	—		—	—	—
,, 7 ,, ..	81·0	78·6	14·4	10		81·0	77·0	22·0		100·4	120	24
,, 8 ,, ..	—	—	—	14		—	—	—		—	—	—
,, 9 ,, ..	81·0	78·8	13·2	14	A	81·0	77·0	22·0		100·4	120	24
,, 10 ,, ..	—	—	—	14		—	—	—		—	—	—
,, 11 ,, ..	81·0	79·0	12·0	11		81·0	77·0	22·0		100·4	120	24
,, 12 o'c. midnight	—	—	—	11		—	—	—		—	—	—

Conditions which cause pyrexia bracketed A.
Conditions which do not cause pyrexia bracketed B.

I will not here repeat the reasons for believing that the atmospheric conditions under which malarial fever becomes prevalent produce in many an intermittent fever. They have been given in previous papers on this subject in The Journal of Tropical Medicine and Hygiene. It may be remembered that, as I pointed out in previous papers, such atmospheric conditions raise body temperature by producing a retention or accumulation of *water* in the blood, thereby increasing destructive metabolism or heat production in the body, as well as by impeding heat loss from

the body. That there is an increase of water in the blood in malaria is recognized by malariologists, and that such increase of water in the blood increases destructive metabolism or heat production in the body is indicated by (1) its known effect in increasing hæmolysis or destruction of red blood corpuscles, and (2) the fact that the experimental injection of 6 c.c. of pure distilled water into the blood produces a transient rise of body temperature to 37·7° C. (100° F.).

According to some physiologists, human blood contains about 790 parts of water in 1,000 parts of blood. But this is the average. The blood of some contains more, the blood of others contains less water. This difference in the proportion of water in the blood of different individuals seems to me to be the personal factor, the predisposing cause, which determines whether the individual's body temperature will rise above normal or not when he is exposed to the bad atmospheric conditions, the mal'aria, which raise the body temperature of others, whether in the spinning and weaving sheds of Lancashire and of the North of Ireland or in climates wherever and whenever malarial fever is prevalent.

To illustrate this suggestion, suppose that two men have, respectively, 780 and 800 parts of water in their blood. The first has ten parts less, and the second ten parts more than the average 790 parts. If these two men are exposed to atmospheric conditions which cause a retention or accumulation of water in the blood, equal to 10 parts in 1,000, from an exposure of twelve hours, then at the end of the twelve hours' exposure the amount of water in the blood of the first man will be only 790 parts, whilst the amount of water in the blood of the second will be 810 parts in 1,000 of blood.

As increase of water in the blood increases hæmolysis, destructive metabolism and heat production in the body, the production of heat in the body of the latter man will be greater than in the former. And it is this greater production of heat in his body, in conjunction with the diminished heat loss from the body caused by the atmospheric conditions in which both men are immersed, that furnishes an explanation as to why the body temperature of the latter man will rise above normal, he will suffer from fever, whilst the body temperature of the man with less water in his blood will not rise above normal, he will be *immune*.

In this climatic view of malaria the hot, damp, stagnant atmosphere under which the disease becomes prevalent is, by the impediment which it presents to loss of heat from the body, the exciting cause of the fever, whilst the proportion of water originally in the individual's blood is, from its effect on heat production in the body, the predisposing cause which determines whether he will contract fever or will be immune to any rise of body temperature so caused.

This suggestion, that in malarial climates those who have originally a greater proportion of water in their blood are those who are most liable to suffer from malarial fever, whilst those who have originally less water in their blood are those who may be expected to enjoy immunity, receives some confirmation from the fact that the specific gravity of malarial blood is known to be below the average, and also that the proportion of water in malarial blood is known to be above the average.

NOTES ON THREE CASES OF PARANGI, TREATED WITH DR. CASTELLANI'S MIXTURE.

By Dr. E. C. Spaar.

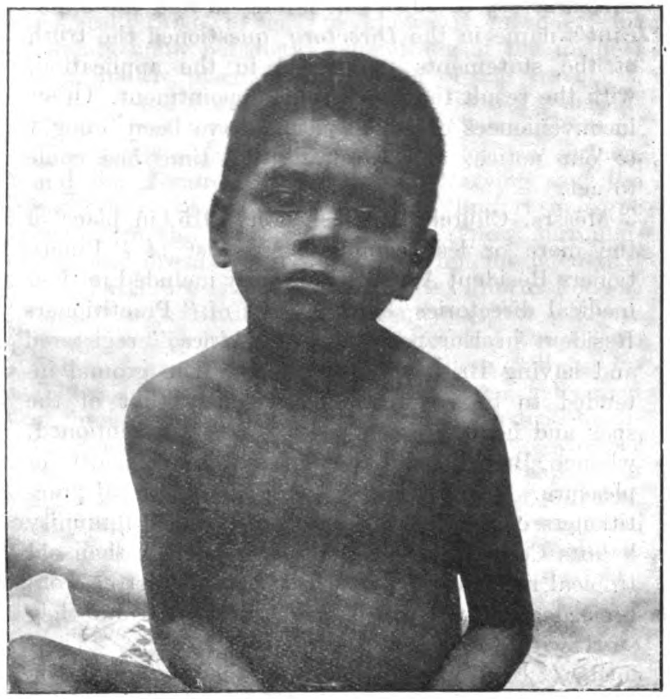
Ceylon Medical Service.

It may be of some practical interest to put on record the results I have obtained in the treatment of three cases of parangi by using Dr. Castellani's mixture which contains tartar emetic 1 gr., sodii

Before treatment.

salicyl. 10 gr., potass. iodid. 1 dr., sodii bicarbonate 15 gr., to 1 oz. of water. Three doses daily are given, diluted in four times the amount of water, to adults and youngsters of over 14 years of age; half doses to children of 8 to 14 years of age, and one-third or less to younger children. The active drugs in the mixture are—according to Dr. Castellani—the potassium iodide, and in a less degree the tartar emetic, while the sodium salicylate seems to hasten the disappearance of the crusts. The presence of a large amount of bicarbonate of soda, though making the mixture very inelegant, apparently prevents to a great extent the symptoms of iodism and decreases the emetic properties of the mixture, in this way rendering possible the administration of massive doses of potassium iodide and large doses of tartar emetic.

Case 1.—Ranage Marthenii, a Singhalese child, aged 5, was admitted into the Clinic on April 21, 1914, with manifestations of the disease on the lower half of the right leg and the face. The primary frambœsical lesion was found on the outer aspect of the right ankle just below the malleolus, and was said to have appeared two months previously. On admission the ulcer was seen to be of an oval shape of 2 in. diameter in the long axis, and to be covered with clean granulations. It was very painful. Around it were other small frambœsiform ulcers, and several typical granulomata were seen on the face, the lower part of the left leg and the left palm. The family history was good and showed no taint of any infection, but the village from which he came was known to be a hotbed of parangi.



After treatment.

Treatment and Progress.—For the first two months the only treatment adopted was local, the ulcers being dressed with a 1 in 1000 solution of corrosive sublimate, but no improvement of any kind was noted. Then Dr. Castellani's mixture was administered (one-third doses). The result of the treatment was very gratifying. In five days' time all the ulcers were found distinctly smaller, cleaner, and drier, and a few days later they had nearly healed. After two weeks' treatment he was pronounced free from the disease, and was discharged.

Case 2.—A Singhalese, Juse, aged 12, was admitted into the Clinic on July 8, with manifestations of the disease. The primary lesion (frambœsioma) was a large one, occupying the outer aspect of the lower half of the right leg, and had appeared three months earlier. The rest of the body, particularly the back, was covered with innumerable granulomata. The first three months the patient had potassium iodide in 5 to 10 gr. doses thrice daily. There was practically no improvement, in fact the pain and itchiness of the eruption became very severe and several new ulcers developed. On October 22, Dr. Castellani's mixture was started (half doses) and in two weeks a very marked change was noticeable, most of the ulcers being healed or nearly so, and on December 18, *i.e.*, in three weeks' time, the mixture was discontinued altogether and the patient discharged, cured.

Case 3. — Appusingho, Singhalese, aged 40, was admitted with frambœsiform ulcers on face, trunk, and upper half of right thigh. On December 6, he was put on the mixture. By the 17th the ulcers were nearly healed, and on the 22nd the patient to all appearances was completely cured.

Conclusions.

The treatment of three cases of parangi with Dr. Castellani's mixture was very satisfactory. The most remarkable fact was the extreme rapidity with which the improvement took place, only a very few days after starting the treatment.

THE DOG-FISH AS FOOD.

The dog-fish has long been the most detested of fish by the fishermen on British coasts. It is credited with predatory onslaughts on other fish, especially the herring, and when caught in the nets and brought ashore it is usually thrown aside as useless. In some places, however, especially in America, it is used as a fertilizer, oil is extracted from it, and its skin cured for leather. It is now proposed to utilize the dog-fish as food, and experiments in canning the fish are now being made. It is peculiar how some fish, at one time shunned as food, have within recent times been added to our dietaries; amongst these halibut and sword-fish are perhaps the more noticeable. Even mackerel, at one time excluded from the table of the well-to-do, now figures as a favourite. The sea-mussel is also spoken of as a possible future addition to the list.

NEW OIL-BEARING NUT.

In the Philippines an oil-bearing nut or seed has been brought into notice. The plant—a large tree —is believed to belong to the genus Amoora or Dysoxylum, which is related to a family of plants characterized by their bearing oil, in many instances of commercial value. The oil, so far as it has been studied by the Philippine Bureau of Science, is available only for soap-making or similar uses, but its bitter taste renders it unpalatable, and the fact that it does not dry well renders it unsuited for varnishes and paints. It is, however, known to be a luminant, as the inhabitants of the Island of Catanduanes, whence the plant has been obtained, have long used it for that purpose.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 2, 1915.

AN OVERSEAS MEDICAL DIRECTORY.

FOR some time we have considered the advisability of publishing a list of medical men practising in our Crown Colonies and Protectorates, and in the several parts of the world other than those where men holding British diplomas are practising their profession.

It will be observed that in the *Medical Directory* for 1915, by Messrs. Churchill and Co., the list of those practising abroad has not been published, or only to a limited extent, and in consequence some inconvenience, not to mention some heart-burnings, have been communicated to us as the result.

We have thought, even when the "Practitioners Resident Abroad" list was published, that but scant justice was done to the doings of these men as regards papers published, &c.

The necessity for a directory of this kind was brought home very keenly lately by a well-known medical man home from "somewhere in Asia," who applied for an appointment in connection with a private hospital, being sent out to the seat of war. The hospital committee turned to the *Medical Directory* of 1915, but failing to find the applicant's name in the *Directory*, questioned the truth of the statements mentioned in the application, with the result that he lost his appointment. Other inconveniences of a like nature have been brought to our notice, and we think the time has come to act.

Messrs. Churchill published in 1915, in place of the more or less comprehensive list of "Practitioners Resident Abroad," formerly included in their medical directories, eleven pages of "Practitioners Resident in Europe and North Africa," registered and having British qualifications. The ground intended to be covered was evidently that of the spas and health resorts in the districts mentioned, whence British folk drift in search of health or pleasure. A most useful list, and to tropical practitioners especially, for no class of the community haunts Continental spas more persistently than old tropical residents. To these people a "letter from their doctor" is part of the armamentarium they start with to present to the spa doctor. "Their doctor" can only find out who the doctors at the spa are through the *Medical Directory;* therefore, the list now included remains most useful. But the *Medical Directory* has come to be more than a mere guide to where and who the doctor is, what qualifications and appointments he holds, and if he has any speciality. Instead, it is to the public what the *Medical Register* is to the doctors; the public know nothing of the *Register* and have come to regard the *Directory* as being the official notification to the world of British practitioners, and if a doctor's name is not in the *Directory* then is he apt to be looked at askance, or until such time as he has been able to furnish proof of his identity or the truth of his assertions as to qualifications. We believe, therefore, that it is not only opportune, but a necessity, that the names, &c., of medical men resident abroad should be

published, and it is with this idea before us that we bring the matter forward. A publisher is ready to take the matter in hand, and it lies with the medical men themselves to state whether they desire the work to be done for them and in their interests, and whether they are ready to support by ordering a copy of the *Directory* to be sent them. There is plenty of time to get it out by 1916 if the list is returned within a week or two of being received.

There is nothing more carefully inquired into by people leaving British shores for the first time, to take up residence in any particular colony or locality, than as to the quality of the medical men they will find there. There may be only one British qualified doctor in the place, but in larger centres there may be several, and amongst these some doctor of their acquaintance at home is generally able to get to know, if he does not already know personally, something of the medical men in the place of destination of the travellers. It is a great thing for intending residents going out for the first time to have a note "to the doctor." The diseases they have heard of are so serious, and the climate reported to be so trying that the note they possess helps to bring comfort in some degree to the inexperienced facing new surroundings and dreaded climates. It is not intended that the *Directory* should confine its information to doctors with British diplomas only; others who are recognized by the "Medical Acts" of the Crown Colonies as entitled to practise there will be included as far as possible. These are generally men of foreign nationality, but possessing medical qualifications of recognized universities, &c., whether from European, American, or Indian schools, or from those of overseas British Dominions, Canada, Australia, New Zealand, &c., where recognized medical schools are met with. It is hoped also to give more space to writings and papers published by the medical men included in the *Directory* than was the case in the *Medical Directory* heretofore. Many important papers and publications were omitted from the previous directories owing, no doubt, to want of space. But seeing that much of the advancement of modern medicine is due to work of British medical men resident abroad, it is important that these should be notified at some length.

It will no doubt also be desired by many medical men who have practised their profession abroad but are now dwelling at home to have their names included in the *Directory;* this is very desirable, as doctors abroad would know where men with tropical medical experience are to be found, so that they may direct their patients where to find them. In many other ways may the *Directory* be rendered useful, such as information concerning schools of tropical medicine, &c., and we are convinced that there is a call for a directory of the kind mentioned, whether published yearly or once in two years. We hope to be able to circulate lists to fill up at an early date.

J. CANTLIE.

Abstracts.

THE DISTRIBUTION AND SPREAD OF DISEASES IN THE EAST.[1]

By ANTON BREINL, M.D.

FOR the understanding of the distribution of disease in the East, it would seem necessary to deal briefly with the origin of the earliest inhabitants of Malaysia and Oceania.

According to Hutchinson, there does not exist at present a generally accepted theory. It appears probable that the earliest inhabitants were descendants of tribes of an ill-defined Negro type, which gave rise to the Andamanese, the Semangs of Malaysia, the Aeta of the Philippines, and the Pygmies of New Guinea on the one hand, and to the Tasmanians, the Papuans, and the majority of the Melanesians on the other hand.

At a very early age the brachycephalic Mongols, called Proto-Malays by Haddon, mixed with these original inhabitants, after having migrated from the Malay Peninsula to the islands further south, giving rise to the lighter-coloured races in the Pacific.

A second early migration fused with the Proto-Malays, forming the Proto-Polynesians of Haddon, and these migrated into the western Pacific, where, mixing with the early black people, they gave rise to the Melanesians, whilst others passing through or around Melanesia, went on to Tonga and Samoa, and later to Tahiti and Raratonga, of the Cook Islands, spreading later to Hawaii and the Marquesas, and at a still later date to New Zealand.

Earlier migration still, perhaps of lowly developed Asiatic stock, may have given rise to jungle tribes of India and Ceylon, and perhaps to the Kakhyers of Northern Borneo, to the Sakai of Malaysia, and to one element in the Australian race.

These migrations, or voyages, are supposed to have begun by a migration to Java as late as 65 B.C., and did not cease till about 1350 A.D., and to them must be attributed the varied character of the population of most of the Pacific Islands.

Within the last two hundred years very little migration appears to have taken place, with the exception of the Malays, who were great fishermen, and made long journeys in their prahus in search of *bêche-de-mer*, visiting lands as far distant as the north coast of Australia.

This lack of communication may explain the fact that many of the diseases in the East are, generally speaking, confined to certain areas. Various epidemic diseases, such as cholera, plague, smallpox, &c., have spread all over the densely populated eastern countries, but have not been able to gain a firm foothold in the numerous islands of the Pacific.

The different types of malaria occur all through Tropical Malaysia and Oceania, in varying severity.

[1] **Abstracted from *The Medical Journal of Australia*, June 12, 1915.**

This disease is to be found as far north as the southern parts of Korea, and is very prevalent in Formosa, where the number of deaths from malaria during the years 1906 and 1908 varied between 10 per cent. and 11 per cent. of the total death-rate.

In Japan the mosquito, *Nyssorhynchus sinensis*, acts, according to Kinoshita, as the carrier of the parasite *Plasmodium vivax*, which causes the benign type of malaria, whilst *P. falciparum*, the cause of pernicious malarial fever, is transmitted by another species of mosquito, namely, *Anopheles listoni*.

Malaria is found throughout China, and some of the very worst malarial regions are to be found in tropical China, not only along the coast at Hong Kong, Canton, &c., but along the course of the rivers, where fever is just as pernicious as in the coastal districts. A severe form of malaria occurs in the Malay States, the Dutch East Indies, and most of the Pacific Islands.

In New Guinea, malaria seems to be more prevalent in the coastal districts east of Port Moresby than in the western parts, and in this region the percentage of children with enlarged and palpable spleens, a symptom which constitutes the malaria index, is very high indeed, being in many districts as much as 80 per cent. of the total number of children examined. In Western New Guinea, in the swampy, muddy parts, malaria seems only prevalent during the season when the prevailing winds are from the north-west, coincident with the presence of numberless mosquitoes, which vanish with the advent of the south-east winds.

In Tropical Australia malaria shows a fairly wide distribution. Cases have been reported from the northern parts of Western Australia and from the Northern Territory, where, in 1909, 34·10 per cent. of the total number of admissions to the Darwin Hospital suffered from fever.

The severest outbreaks of fever occurred in 1909 and 1910, during one of the mining rushes to the Territory, when the Umbrawarra Creek Tin Field was opened up. Numbers of miners had come across from New Guinea, a good many of whom were in a chronic state of pernicious malaria, and as the fever-carrying mosquito, *Nyssorhynchus annulipes*, was abundant, it spread rapidly through the mining camp, causing a number of deaths.

In Northern Queensland, sporadic cases are observed from Cape York Peninsula as far south as Townsville. In some seasons Cairns seems to be a hotbed of malaria of a virulent character, and sporadic cases have been treated at the Townsville Hospital from the scrub districts between Cairns and Townsville.

The distribution of malaria in Australia corresponds, on the whole, with the incidence of the mosquito, *N. annulipes*, which acts as the carrier of the parasite. It is curious to note that there are localities where the mosquito has been found, but where malaria is practically non-existent. An explanation of this apparent discrepancy has been put forward by Sir Ronald Ross, the great authority on malaria. According to him, the amount of malaria depends not only upon the number of suitable mosquitoes, but upon the proportion of those which succeed in biting human beings suffering from malaria, in living long enough to mature the parasite within themselves, and in again biting human beings and inoculating them with the parasite. Not long ago it was a commonly accepted idea that the female mosquito (which alone sucks blood, the male being entirely vegetarian) feeds only once, lays her eggs a few days later, and dies. But recent experience has proved that some species of malaria-carrying mosquitoes can be kept alive in captivity for as long as fifty-nine days.

According to Ross, possibly a quarter of the total number of anopheles may succeed in biting human beings once. A third of these may live for a further ten days, of which only a quarter may succeed in biting again. That is, only one out of forty-eight female mosquitoes can ever have a chance of carrying malaria.

As these figures apply only to the proportion of mosquitoes to each person, the ratio will be much smaller in thinly inhabited areas. This calculation shows that it requires a great number of suitable mosquitoes, and a number of patients harbouring parasites in their blood, for malaria to become endemic.

Dengue, another fever of very wide distribution in the East, is a fever which gives rise to the most diverse symptoms. The onset is sudden; the body temperature rises without any premonitory symptoms. The patient complains of severe pains in the head, in the lumbar regions, and in the bones; hence the popular name of "break-bone fever."

According to Ashburn and Craig's experiments, the hitherto unknown parasite of dengue fever is transmitted by *Culex fatigans*, the common house mosquito, which is ubiquitous throughout the Tropics, and it is due to the enormous prevalence of this particular mosquito that the disease has become so widely spread.

Dengue fever occurs throughout the East, assuming now and again a pandemic character. It has been observed in Formosa, Tropical China, the Philippines, the Dutch East Indies, New Guinea, and has invaded most of the islands of the Eastern Archipelago. According to records, it was introduced into Queensland as recently as 1894, probably much earlier, as I was informed that in 1879 a fever epidemic with hardly any mortality appeared in Townsville. Since then it has swept over the populated parts of Queensland and the northern parts of Western Australia into the Northern Territory. One attack of dengue fever confers only a transient immunity, and, in consequence, every now and again the whole population of the northern towns has to pay its tribute to the unwelcome guest.

The appearance of a dengue fever epidemic is always a serious matter, since it invalids the sufferer completely for about two weeks, and leaves

the convalescent patient in a singularly depressed state for weeks afterwards, so that, after a severe dengue epidemic, the number of suicides is always above the average.

Speculations as to the origin of new epidemics are fascinating. Does the dengue fever parasite lie dormant in the mosquito, its intermediary host, for months, and even years, and suddenly become again conscious of its virility when the acquired transient immunity of the populace has passed away, or is always a fresh case of the disease introduced from outside giving rise to the new epidemic? This latter conception is more likely, since one can, as a rule, see the spread starting from one centre, from street to street, and from town to town.

Malta fever, a far more serious complaint than dengue, has not yet been able to gain a firm foothold in the East. This fever comes on gradually with headaches, bone-aches, and lassitude. The patient is very ill for months, and often slight improvements and relapses follow each other at irregular intervals.

China is the only eastern country where cases of Malta fever have been known; but it is not improbable that in the near future some of the hitherto undescribed fevers will be diagnosed as Malta fever.

Bacterial Diseases.

Plague and cholera are more or less endemic in the East. The symptoms of plague are so characteristic that it cannot be mistaken for any other disease. It may appear in the form of pneumonic or bubonic plague, the former resembling, clinically, a very acute form of pneumonia, when with a sudden rise in temperature lung symptoms develop, and in the majority of cases death takes place in from thirty-six hours to three days. In the case of bubonic plague the lymph glands swell up suddenly, accompanied by a general feeling of severe malaise.

Plague is widely distributed in the East, being endemic in the southern parts of Japan, and in China, in the Malay Peninsula, and Java.

Within the last two years a fatal pandemic of pneumonic plague swept over Manchuria, causing a great mortality.

Now and again it invades the Philippine Islands, and even Australia has been visited more than once by more or less severe outbreaks of this much-dreaded disease.

In India, plague has been rampant for a long time, and it is quite a common occurrence to find 500 to 600 deaths recorded in the course of one month.

Plague is propagated by means of infected rats, and the bacilli are transmitted to a human being by the bite of the rat-fleas. According to the conclusions of the Indian Commission, the spread of plague is not so much due to the migration of rats as to the presence of infected rats on ships, and the introduction of infected fleas in merchandise. We have, therefore, in plague, a disease which might, at any time, be introduced again into Australia.

Cholera, an epidemic disease, characterized by violent gastro-intestinal symptoms and collapse, has, in all probability, originated in the East. Symptoms corresponding to this disease have been described in the most ancient Indian literature, and it was recorded in Java as far back as 1629. After an epidemic in Calcutta, which lasted till 1823, cholera began to spread eastwards to Malacca, Penang, Singapore, and Manila. In 1832-33 a pandemic appeared in Europe, United States, Cuba, and even Australia became infected, and in 1906 another severe outbreak occurred in Japan, China, and the Philippine Islands. At present, cholera is endemic in Japan, China, Malay Peninsula, Borneo, Celebes, and Java, places which are in close proximity to, and in constant communication with, the northern parts of Australia.

The possibilities of the introduction of this scourge into Australia are thus very great, and its advent can only be prevented by the strictest quarantine regulations.

Dysentery, a disease of world-wide distribution, is commonly observed in the East. The two forms, the amœbic and bacillary dysentery, the former caused by a protozoan, the latter by a number of biologically closely allied bacteria, occur endemically throughout Japan, China, the Philippine Islands, and the Dutch East Indies. Bacillary dysentery has made its appearance in New Guinea within the last two decades, and has been responsible for a great number of deaths amongst the natives. It has been spread by dysentery carriers—natives who have apparently recovered from the disease, but harbour numberless fully virulent bacteria in their intestines. Indentured labourers who have survived an attack of dysentery carry the infection to their village, thus causing, on their return, an outbreak of the epidemic. It is certainly the most important disease in New Guinea from an economic point of view.

In Northern Australia, dysentery is a comparatively rare complaint. On more than one occasion, however, it has been introduced into Thursday Island by labourers recruited from New Guinea.

Another intestinal complaint peculiar to the East, and of uncertain etiology, is sprue (tropical aphthæ), of which disease a catarrhal inflammation of the mucous membrane of the intestinal tract is the main symptom, giving rise to chronic diarrhœa. The motions are large, of greyish colour and frothy, the patient emaciates, the skin becomes dry and dark, so that the complexion of an advanced case is of an ochre colour.

Cases are found in Japan, in China, in the Philippines, Malaya, Sumatra, Java, New Caledonia, and the Fiji Islands. In Australia, the occurrence of sprue is confined to the coastal belt between Mackay and Cairns, most of the cases originating in Bowen, Ingham, and Innisfail districts. No cases, or even records of cases, have been obtained from New Guinea.

Leprosy is a common complaint throughout all tropical countries, and has not spared the East. In Japan and China leprosy is extremely prevalent, and

from olden times the disease has been rampant in these countries.

Cases are seen more or less frequently in the Philippines, Dutch East Indies, and especially in New Caledonia, where it has been introduced within the last fifty years. In New Guinea lepers are met with in small numbers along the coastal districts. A number of cases were diagnosed in the Mekeo district, west of Port Moresby, and on Trobriand Island, situated off the north-east coast. On the other hand, districts west of the Vailala River, where the oil-fields are situated, seem singularly free from the disease.

Leprosy is fortunately comparatively rare in Australia. Amongst the aboriginals in the far north lepers are found in small numbers, whilst now and again a case is discovered in a white man.

In New Zealand, in the olden times, leprosy was widely distributed, and was known under the native name "Ngerengere."

Of complaints which are most probably of purely Eastern origin, and have spread far and wide, beriberi is perhaps of the greatest economic importance.

According to Scheube, references to this disease, under the name of "Kake," occur in Chinese literature of 200 B.C., and these manuscripts contain unmistakable descriptions of beriberi. In a Chinese book, written about the tenth century, the dry and wet forms of beriberi are already differentiated, and descriptions of this disease also occur in Japanese medical literature of the ninth century. Without a doubt, however, other complaints causing dropsical conditions of the legs have been confused with true beriberi.

The most pronounced pathological lesion of beriberi is a degeneration of different nerves of the body, mainly of the nerves of the legs and the heart. It may exhibit two clinical aspects, which are differentiated into the so-called wet and dry type.

Beriberi occupies a large and anxious share of Eastern diseases. It is prevalent in Japan, Indo-China, and China. Frequent cases occur in the Philippines, in the Malay States, and in Dutch East Indies. A number of cases have been observed among the native labourers in New Guinea, whilst numerous cases originated among the coloured crews of the pearling boats in Thursday Island, filling the hospital at certain seasons of the year to its utmost capacity. A small epidemic is said to have occurred in Western Australia, and a few cases have been described from Western Queensland, whilst quite recently this disease has appeared in some of the Pacific Islands, especially Fiji and New Caledonia.

In spite of the large amount of work done on the etiology of this disease, it is still, to a certain extent, shrouded in mystery. It is a generally accepted opinion that the disease is due to deficient diet, to the exclusive use of highly polished rice; in other words, rice of which the husk has been completely removed. It is very probable, however, that even at present several different, but closely allied, diseases are classed under "beriberi."

Another disease of very wide distribution in the Eastern Tropics is yaws, or *Frambœsia tropica*. Yaws is purely a tropical disease, closely resembling syphilis in its clinical manifestations. It is accompanied by an eruption, which may attack any part of the body, and is most frequently found on the hands and soles of the feet.

Yaws is very common in India, the Malay Peninsula, in Siam, Java, and in the Philippine Islands, and throughout the Pacific Islands. In Fiji, every child is said to contract the disease in infancy. In China, cases of yaws are only rarely encountered, and then mostly in coolies returning from the Straits Settlements.

A mild form of yaws prevails in the Torres Straits Islands, where nearly every child examined had some sign of a past or present attack.

It also occurs amongst the aboriginals of the Northern Territory, and, during my visit there, I was informed that many of the aboriginal children were infected.

In New Guinea, as far as visited, the disease is rampant. A large percentage of the children in the coastal villages suffer from yaws in the different stages, and many of the adults have the curious scar formation around the mouth, the result of a past infection. Europeans, on the whole, do not contract yaws, as this disease is only propagated by contact.

Filariasis and Elephantiasis.

Filariasis is a disease caused by the presence of a nematode worm, *Filaria bancrofti*, about 4 in. in length, in the lymphatic system of human beings, giving rise to the most varied clinical symptoms, lymphangitis, abscess formation in different parts of the body, chyluria, and last, but not least, elephantiasis, an enormous swelling of the infected parts.

The worm larvæ live in the blood of the patient, and are, curious to say, in many cases, only to be found in the peripheral blood at night time. In the day time they live mostly in the lungs and in the larger vessels. The larvæ are very small, only about one-eightieth of an inch in length, and are surrounded by a sheath, in the interior of which they may be seen moving backwards and forwards.

Filariasis is a typical mosquito-borne disease. The filaria larvæ are taken up with the blood by a certain species of mosquito, in which they undergo a further development before being able to cause infection. From the stomach of the mosquito the developing larvæ emigrate to the labium, a part of the proboscis of the insect, and there they await an opportunity, when the mosquito bites again, to enter the blood-stream of man, where they develop in the course of about a year into mature adult worms.

In Japan, filariasis and elephantiasis are known to occur, but it is only the most southern part of the great island which is affected by the disease. Throughout China, filariasis is common, and it was in China where Sir Patrick Manson made his discoveries on the life-history of the parasite.

Filariasis is common in the Philippine Islands, in Guam, it is present in the Malay Settlements, in the Dutch East Indies, New Guinea, Queensland, and the Northern Territory, and it is very widely distributed in most of the Pacific Islands.

It is probable that all the filariæ of the different Eastern countries belong to one and the same species, although attention has been drawn lately to the fact that the typical nightly presence and daily absence of the parasites from the peripheral blood is not common to all the larvæ, but in some cases they are to be found whenever sought, day or night.

The Chinese microfilaria is a nocturnal filaria (from this peculiarity hails the name *Microfilaria nocturna*). The Philippine microfilaria, as well as the microfilaria in the blood of some of the New Guinea natives, is of the non-periodical type. The nocturnal filaria, however, was found to exist in New Guinea as well.

In some of the Pacific Islands, as, for example, Fiji, the non-periodical filaria exists, and *Stegomyia pseudoscutellaris* acts as intermediary host. This same species of mosquito is prevalent in Eastern New Guinea, and it is possible that the distribution of the non-periodical filaria may be coincident with the presence or absence of this species of mosquito.

In Queensland, the microfilaria show, without exception, the typical periodicity.

Filariasis is very irregularly distributed in Queensland. The disease is more prevalent in Brisbane and Port Douglas than in Townsville. In Brisbane, nearly 17 per cent. of the total admissions to the hospital show the parasite in their blood; in Townsville, however, only 3·4 per cent.

Elephantiasis occurs in all regions where filariasis is common. More than once cases were seen in New Guinea, in which the extent of the swelling was as well marked as in any of the famous textbook pictures.

Of diseases which are more or less confined only to parts of the East, Gangosa offers some interest. Gangosa, or "Rhinopharyngitis mutilans," is an ulcerative condition of the nose, palate, and throat, which begins, as a rule, as a thick, œdematous swelling on the upper lip, and spreads into the nasal cavity, to the pharynx, and often to the skin of the face and neck, destroying the greater part of the face, and giving rise to a most hideous appearance.

Cases of gangosa were first described as occurring in the Ladrone Islands, Caroline Islands, Guam, and later in the Philippines. It is endemic in British New Guinea, and numbers of cases have been observed in the coastal districts between the Fly River and Samarai. It has been found in the Torres Strait Islands, is most common in Murray Island, where it was referred to as far back as 1822 by Dr. Wilson, in his narrative of a "Voyage Round the World."

Another typical Eastern disease of limited distribution is the "Juxta-articular nodules." In the legs and arms, as a rule, in proximity to the joints, nodules are found in the subcutaneous tissue of varying sizes—sometimes as large as hens' eggs, sometimes quite small and of hard consistency. Sir William MacGregor, when Governor of New Guinea, pointed out that the nodules occur mostly on parts which come in contact with the ground when the native is resting. The frequency of their occurrence in some of the villages, their total absence in others, however, supports the opinion of a parasitic origin, which has been confirmed lately by the discovery of a fungus in the nodules.

Agchylostomiasis.

Of helminthic infections, this is perhaps of the greatest importance from an economic standpoint. In the tropical parts of China, the Philippines, throughout the Dutch East Indies, in British New Guinea, and in Northern Queensland, hook-worm is a frequent and unwelcome guest.

Agchylostomiasis may be caused by two morphologically, but closely allied, nematode worms—*Agchylostoma duodenale* and *Necator americanus*—both of which give rise to similar clinical symptoms, namely, a profound anæmia.

The first species, *Agchylostoma duodenale*, is found in China; the second species, the American hook-worm, is the more common in the Philippine Islands and in New Guinea, whilst both species are frequently encountered in Queensland.

A brief survey of the life-history of the hookworm, which is appropriately known by the lay community under the name of bloodsucker, will demonstrate the important bearing of its presence and the danger of its further spread.

The adult female worm lives in the small intestine, and an enormous number of eggs is passed in the motions. In a hot and humid atmosphere these eggs begin to develop, and after a short interval a small embryonic worm appears. The larva leaves the egg, and grows to about one-fortieth of an inch, and moves into moist soil, or, if possible, into water, and may live there for several months.

This mature larva is awaiting now an opportunity to infect. When it comes into contact with human skin it bores its way through, enters the circulation, and passes by way of the heart into the lungs, and wanders through the trachea and œsophagus into the intestine, where the adult worm develops.

As an enormous number of eggs is passed by each infected individual, and as the sanitary conditions in the scrub leave much to be desired, it can well be imagined that in suitable localities the infection is already well established, and that unless stringent measures be taken a further spread must be expected.

It is very curious that agchylostomiasis has not been found in the Australian mines, as it is well known that the damp heat in mines is especially favourable for the development of the parasite. Experiences in other countries, such as England, Belgium, and Germany, have shown what serious consequences might arise from the employment of a few infected individuals in a suitable mine.

From this short survey of tropical diseases which occur in the Eastern countries, it becomes apparent

On the third or fourth day, according to the temperature, typical rhabditiform larvæ could be seen under the low power.

Ascaris lumbricoides.—In nine cases ascaris ova were seen in the company of other parasites, and they were found alone in twenty specimens. In October, 1913, some of the fæces containing numerous ova was mixed up with distilled water and put away in the warm incubator. Another specimen was kept in 0·2 per cent. hydrochloric acid, and a week later a little of this was transferred to normal saline. All the three preparations were kept at 37° C. for six months. This was done to give the ova a chance of developing, but as nothing happened they were kept in the incubator for another six months. At the end of one year no change was noticed, so the tubes were left at the room temperature for six months more. After eighteen months the ova were found to be practically unaltered in appearance.

Trichocephalus trichiuria.—Ova were met with singly in eight specimens; they were seen with other parasites in four cases.

Tape-worm ova, which were almost certainly *Tænia saginata*, were found alone in nine cases, and in the company of other parasites in the remaining nine.

Oxyuris vermicularis ova were discovered only twice, once along with ankylostome ova and on the other occasion with tape-worm eggs. In both stools a few adult worms were found. This finding probably does not represent correctly the prevalence of the *Oxyuris vermicularis*, as we are aware of a considerable number of cases of infection among the general population of Lucknow.

Strongyloides intestinalis was found only in one case. The patient was a Mohammedan male, aged 50. He came in with cough, and harboured *Ankylostoma duodenale*. An actively moving creature suddenly appeared in the field of the microscope. The movement was of a wriggling character. Sir Leonard Rogers diagnosed it to be a strongylus. This patient's stool was watched from day to day, but no more strongyloides could be seen for six days. On the seventh day the worm again put in an appearance only to disappear once more. Three days after this we lost sight of the man.

Entamœbæ and Cysts.—Entamœbæ were found alone in seven cases; with numerous trichomonas in four; with ova of intestinal worms in six; and in two cases there were also cysts containing eight nuclei.

With regard to the classification of the amœbæ found, we are not able to satisfy ourselves that they belonged to more than one species. They were large in size, actively motile, and in many cases contained red blood corpuscles; there was a marked distinction between the ecto- and endoplasm, and so they may be regarded as having the appearance of "*Entamœba dysenterica*." They were found only in cases having the clinical manifestations of dysentery, and so they may fairly be assumed to be amœbæ of dysentery. All the cases yielded rapidly to emetine treatment, and the amœbæ disappeared from the stools.

Cysts were found in twenty-two cases in all—only two of these were actually suffering from dysentery. The average diameter of the cysts was 30 microns, and the number of nuclei was never less than eight, this being the commonest number, but sometimes more than eight were observed. In two specimens the cysts were very plentiful. On both occasions some of the fæcal matter was mixed up with normal saline and injected high up into a kitten's rectum by means of a soft catheter and syringe, in the hope of seeing adult entamœbæ develop from the cysts. The kitten's motions were carefully watched for several weeks, but the cysts disappeared in a day or two and no amœbæ appeared. No feeding experiments have yet been done.

Balantidium coli was seen singly in one case only; in another it was found with trichomonas; and in the remaining two there were ova of ankylostoma as well. All the four patients were suffering from chronic diarrhœa.

Trichomonas intestinalis was always found in liquid motions and usually in large numbers. In twenty-two cases it was the only parasite seen. In some cases smears were made and fixed by the wet method. We got quite satisfactory results by staining these smears with iron hæmatoxylin. The dry method was not much of a success for this organism.

Multiple infections.—The highest number of intestinal parasites in a single individual fæces was five, viz., ova of *Ascaris lumbricoides*, *Ankylostoma duodenale*, *Tænia saginata*, *Balantidium coli*, and Entamœbæ. There were two cases of quadruple infection, five of triple, and thirty-one of double infection.

PREVALENCE OF INTESTINAL PARASITES IN THE UNITED PROVINCES.

Number of patients	Ova of Intestinal Worms.							Protozoa.						
	Ankylostoma duodenale	Ascaris lumbricoides	Tricocephalus trichiuris	Tapeworm	Oxyuris vermicularis	Total	Strongyloides intestinalis	Entamœba	Cysts of entamœba	Balantidium coli	Trichomonas intestinalis	Total	Total infection	No infection
600	96	29	12	18	2	157	1	19	22	4	32	77	235	365
							Percentage.							
100	16	4·8	2	3	0·3	26·1	0·16	3·16	3·6	0·6	5·3	12·7	39·2	60·8

Original Communications.

THE CURE OF AMŒBIC DYSENTERY.

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Introductory.—As far as the literature at our disposal indicates we believe that no clear view exists as to the means by which the cure of amœbic dysentery may be definitely ascertained.

The recovery from an attack of amœbic dysentery does not mean that the patient's body has been freed from the amœbæ, because, in many cases, relapses and recurrences may occur after longer or shorter intervals. Further it is possible for the parasites to renew their activities in organs other than the alimentary canal and to cause pathological conditions other than dysentery, *e.g.*, hepatitis and liver abscess. More rarely they may produce lesions in various parts of the body, such as pulmonary abscess, without previous implication of the liver, or an arthritis, or even an invasion of the urinary tract; all of which conditions we have encountered in our work in Khartoum.

We therefore venture to bring forward the following remarks on the diagnosis of amœbic, and especially of cryptic amœbic, infections as well as some observations with regard to the means available for determining when the patient's system has been freed from amœbæ.

The Causal Agent.—The first step towards the *cure of the dysenteries* was the realization that the clinical signs and symptoms might be caused by many very varied ætiological factors, among which certain amœbæ came to be recognized as causal agents.

Our experience in Khartoum points to *Löschia tetragena* (Viereck 1907) as the important causal factor, and we reproduce in fig. 1 a photomicrograph of it as seen when living and moving in the fæces of a case of amœbic dysentery.

We also reproduce in figs. 2 and 4 photomicrographs of two of its cysts as found under similar conditions, and in fig. 3 a cyst of *Löschia coli* (Loesch 1875) for purposes of comparison.

We publish these photographs because we know, from experience, the difficulty which the general practitioner in the Tropics finds in recognizing a resemblance between the living amœba as seen in the fæces and the beautiful representations of stained specimens, or the plainer diagrammatic representations of the same, which he may have for comparison.

We very often test the pathogenicity of the amœba, which we recognize as *L. tetragena*, by injecting some of the fæces containing it *per anum* into the rectum of a kitten; and though in a percentage of cases we have produced amœbic dysentery, and much more rarely liver abscess and congestion of the base of the right lung, still in a number of experiments we have met with negative results, even when the injection has been followed by fever for a few days.

These experiments appear to us to be of importance in attempting to determine the pathogenicity of an amœba found in a latent case of amœbiasis in man, and considered, by its microscopical appearances, to be *L. tetragena.* This, the more scientific aspect of the disease, does not, however, concern us in our present paper.

Cryptic Infections.—Attention has been drawn by Martini, Vincent, Castellani and one of us, Rogers and others to the importance of *cryptic or latent amœbic infections* in the spread of dysentery, and the presence of *amœbic carriers* has been insisted upon, and is in our opinion of the utmost importance not only in the spread of the disease but in the consideration of a cure.

In the "Emetine — Dysentery — Liver Abscess Number," of the *Indian Medical Gazette*, published in March, 1914, Rogers draws attention to the fact that increasing experience reveals the frequency with which amœbic bowel disease is overlooked, and says that in these cases the lesions are commonly limited to the cæcum and ascending colon.

This is in entire accord with our own experience, for we have met with a case which had an attack of dysentery some eighteen months before death. This dysentery was supposed to be cured, and indeed, during the whole eighteen months till his death the patient and his friends considered this to be so. The patient, however, subsequentally died from pneumonia, and on making a *post-mortem* a few ulcers typical of amœbic dysentery were found limited to the cæcum. In scrapings from these ulcers pathogenic amœbæ could be seen. Thus for eighteen months the man was suffering from latent amœbiasis and was an "amœbic carrier."

Latency is by no means always unaccompanied by symptoms, but these are unfortunately not always the signs which we are accustomed to associate with dysentery, though some quickly arouse suspicion.

Irregularly occurring diarrhœa naturally leads to the examination of the fæces and to the discovery of the amœbæ, especially after the administration of a mild purge.

There are, however, much more indefinite symptoms—*e.g.*, our experience entirely supports Rogers in his valuable remarks, the importance of which we fear is not yet realized, with regard to the necessity of administering a purge and subsequently examining the motions for amœbæ in all cases of *indigestion* living in or coming from dysenteric areas. This form of latent dysentery is met with in Khartoum, and has been repeatedly observed by us.

There is another form of latency, to which we believe Rogers was the first to draw attention, viz., the form simulating *appendicitis*, as is evident by the pain in the right iliac fossa over the appendix, together with a sense of resistance or, according to Rogers, occasionally of thickening in that region, and, in our experience, sometimes with mild febrile attacks. These cases may be rare, but they are important and

indicate the necessity for the examination of the blood and fæces.

Cases of *mild anæmia* have also, in our experience, proved to be associated with amœbic infections.

The connection of *hepatitis and fever* with amœbiasis is too well known to necessitate more than mere mention, but our experience of a *lung abscess*, and a *cold abscess in a joint* in cases of cryptic amœbiasis opens up much greater possibilities of fallacy than we believe has been generally realized.

The length of time of the latency of intestinal amœbiasis with recurrent diarrhœal attacks may, in our experience, be as much as ten or more years. We have met with a case in which the latency, without noticeable diarrhœal attacks, must have lasted some three or more years.

The Diagnosis of Latency.—The only quick and ready means for the diagnosis of latency is, in our opinion, a differential leucocytic count. In order to emphasize this point we will quote the following case:—

A young Englishman who had never previously been in the Tropics, though he had been in European districts known to have amœbiasis, was sent direct from London to Khartoum in order to recruit after an operation for appendicitis. Very shortly after his arrival, as he was obviously unwell, his blood was examined and a mononuclear leucocytosis of 19 per cent. (without the addition of the large lymphocytes) was found. As this was unassociated with any enlargement of the liver or spleen and with an absence of malarial parasites and pigment and of any other protozoal parasites in his blood, intestinal amœbiasis was suspected. His motions were immediately examined, but were found to be constipated and no amœbæ could be seen. He was asked to take a purgative, but before he could do so a dysenteric attack set in and amœbæ were easily found on microscopical examination.

It is interesting to note that on his journey from London to Khartoum he suffered from some vague pulmonary symptoms in the left lung high up in the left mid-axillary line. The duration of latency in this case, judging by the history, might possibly have been several years.

The important feature in the differential leucocyte count is the increase of the mononuclear leucocytes without distinct evidence of malarial or other protozoal blood infections, and this should lead to most careful and repeated microscopical examinations of the fæces after the administration of a purgative.

The mere examination of the fæces, without a leucocyte count, may be misleading, because in these latent cases the amœbæ, if present, may be missed for days at a time and then suddenly found in sometimes considerable numbers. The injection of kittens *per anum* with fæces, in which amœbæ cannot be found microscopically, is, in our experience, usually without value.

The Cure.—These remarks bring us to the essential features of the present paper, viz., (a) Can amœbic dysentery be cured, *i.e.*, can all the amœbæ in the patient's system be killed? (*b*) If they can be killed, is there any means of recognizing when this has been done?

With regard to the first we may briefly state that, in our experience, with the advent of Rogers's method of treatment, by means of intramuscular or intravenous injections of emetine, amœbic dysentery appears to be scientifically curable, that is to say that it is possible for the practitioner to cure his patient and to know that he has done so, instead of being in the position of hoping and believing that the disease is cured.

By the term "cure" we mean that the amœbæ of the given infection have ceased to live in the patient's body.

We now come to our second point, viz., if this is so how can the cure be diagnosed? We believe that this can only be definitely attained by repeated careful differential leucocytic counts, especially in cases unaccompanied by other protozoal infections, such as malaria. Our experience shows that with the treatment the amœbæ gradually disappear from the motions; only, however, to reappear after a longer or shorter interval if treatment is stopped too soon.

The important factor is to make a differential leucocyte count as a routine practice at the commencement of the illness and again after the amœbæ have disappeared from the fæces.

Usually after a course of emetine treatment associated with disappearance of the amœbæ from the fæces the mononuclear leucocyte count remains high, or may increase. We now stop the treatment for about a couple of weeks, and, if the patient's health continues to improve, test the mononuclear leucocytic count again and generally find it remaining high. If, however, during this period the patient becomes languid, and particularly if there is discomfort over the cæcum and ascending colon, or other portion of the large intestine, we at once return to the emetine, and in any case after a fortnight we repeat the emetine treatment for a few days. We continue this course of treatment, lengthening the intervals of non-treatment and shortening the intervals of treatment until the mononuclear leucocytic count returns to normal or nearly normal in uncomplicated cases, or is reduced in cases complicated with malaria.

For example: In a case of amœbic dysentery in which emetine was administered and the amœbæ had disappeared from the fæces, while the mononuclear leucocytic count had fallen from 19 per cent. to 7 per cent., it was decided to continue the drug at the rate of only 0·03 grm. once a fortnight. After a short time the patient became slowly worse, suffering from discomfort, at times, over the cæcum, and at the same time gradually the leucocytic count rose to 13 per cent. without any malarial or other protozoal complications. Emetine was then administered in 0·03 grm. doses daily every combined ten and eleven days, when the patient's blood count at the end of six weeks became normal and remained so, as far as it was tested, and now at the interval of more than one year the patient is believed to be quite cured, as he has been exposed to all kinds of weather while training in one of the new battalions.

Eosinophilia.—The differential leucocyte count in our uncomplicated cases treated with emetine has shown an increase in the number of the eosinophile leucocytes in the blood.

This naturally led us to look vigorously for worms, &c., but we have failed to find any evidence of these infections and conclude that this is in some way a sign of bodily reaction against the amœbæ, as with a cure of the amœbic conditions and a cessation of the emetine treatment this eosinophilia disappears.

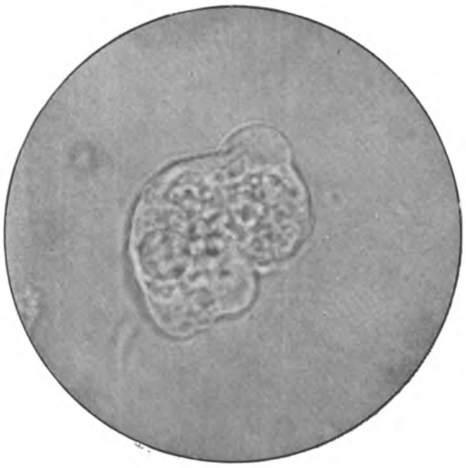


Fig. 1.

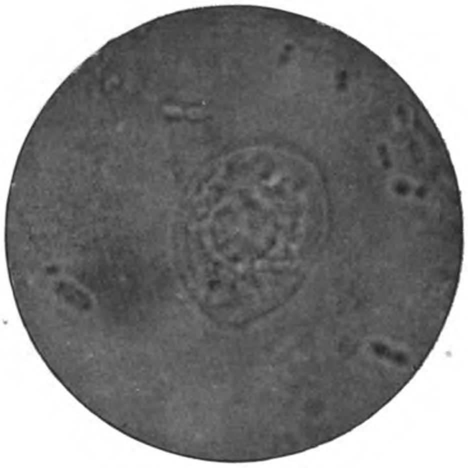
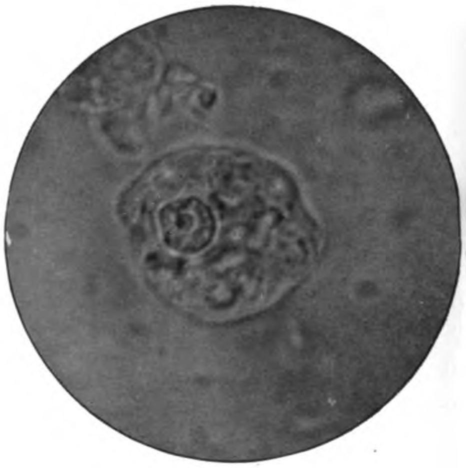


Fig. 2.



ig. 3.

Fig. 4.

To illustrate paper, "The Cure of Amœbic Dysentery," by Albert J. Chalmers, M.D., F.R.C.S., D.P.H., *Director, Wellcome Tropical Research Laboratories*, and Captain R. G. Archibald, M.B., R.A.M C., *Pathologist, Wellcome Tropical Research Laboratories, Khartoum.*

We draw attention to this in order that other observers may investigate the same phenomenon in uncomplicated cases, with a view to determining whether this factor of the leucocyte count may also be of help in diagnosing the cure of amœbiasis.

Practical Application.—Our method of work at the present time in the Anglo-Egyptian Sudan is to make a differential leucocyte count on any person we are asked to see who shows anæmia of non-malarial or non-kala-azar origin, or who has any peculiar intestinal, urinary, pulmonary, or joint affections; and if there is a marked mononuclear increase which cannot be explained by a malarial infection, we administer a purgative and examine the motions for amœbæ on more than one occasion. We draw a number of blanks, but in our opinion we also cure a number of cases of amœbiasis and prevent serious illness.

Under treatment our observations tend to show that the mononuclear leucocytes increase in number, and that they only regain a normal percentage after some considerable lapse of time. The same remarks also apply to the eosinophile leucocytes.

Khartoum,
April 5, 1915.

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ILLUSTRATIONS.

(These photographs may with advantage be examined by means of a lens.)

FIG. 1.—*Löschia tetragena* (Viereck, 1907) as seen alive in the fæces. × 1,500 diameters. Photomicrograph.

FIG. 2.—*Löschia tetragena.* Cyst with one nucleus as seen unstained in fæces. × 2,000 diameters. Photomicrograph.

FIG. 3.—*Löschia coli.* Cyst with one nucleus as seen unstained in fæces. × 1,800 diameters. Photomicrograph.

FIG. 4.—*Löschia tetragena.* Cyst with two nuclei as seen unstained in fæces. × 2,000 diameters. Photomicrograph.

"HAS A MONOWHEEL STRETCHER CARRIAGE POSSIBILITIES?"

By J. A. HARAN, M.D.

Nairobi.

OWING, no doubt, to the restricted width of native paths certain of those resident in parts of the coastlands of British East Africa have apparently found it to be of advantage to utilize monowheel single-seated rickshaws for purposes of personal transport. The seeing of these vehicles led me to speculate on the possibility of making use of the idea in connection with stretcher carriages.

Accordingly, in the early part of last year, I placed myself in communication with a home firm on the subject, and was subsequently afforded an opportunity by the local authorities of having a trial-model built. I attach two photographs of this, which were kindly taken for me by Lieutenant-Colonel Stordy, E.A.V.C.; they are so clear that they will, I

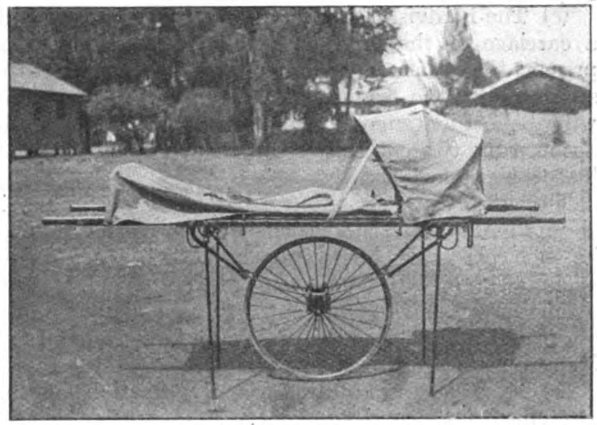

FIG. 1.

think, explain the details of the design. Fig. 1 shows the carriage (with stretcher) waiting; Fig. 2 the carriage (with stretcher) ready to travel.

The stretcher, when placed on the carriage, is fixed by means of clips which are pivoted on the frame of the latter. In addition, the iron loops which the stretcher itself carries on its nether aspect prevent it slipping. The supports of the frame are capable of being maintained in an upright or oblique position according as the carriage is at rest or in motion.

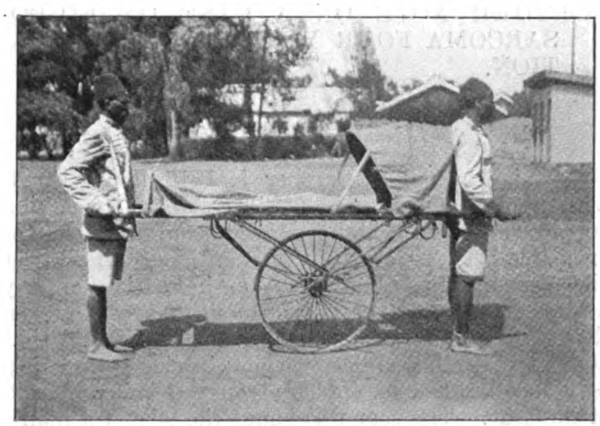

FIG. 2.

Bearers employed to propel the vehicle should be of equal stature, and their height should be such as to allow them, when at work, to keep their arms almost extended at the elbows. They should always take care to wear the customary shoulder straps, as such help them to maintain the equilibrium of the vehicle.

A monowheel stretcher carriage appears to possess the following disadvantages as compared with bi-wheel forms:—

(*a*) The necessity for the exercise of special care when bearers are being relieved.

(*b*) The necessity for paying greater attention to the height, strength, and intelligence of persons proposed to be employed as bearers.

(*c*) The inadvisability of sending but two men with a carriage of the kind, as a third man ought to be present to attend to the raising and lowering of the supports of the frame. This remark applies only where short distances are concerned, as reliefs would accompany the carriage if a journey of any length had to be undertaken.

The disadvantages enumerated being overcome, it should be found possible to use a monowheel carriage in such places as bush tracks where other forms—such as the bi-wheel—could not be employed.

The model shown in the photographs is but a first effort and will require the following improvements so far as one can judge, viz.:—

(*a*) More secure means for the fixation of the stretcher to the carriage frame.

(*b*) A lessened diameter of wheel with a broader rim covered by a pneumatic tyre with a somewhat flattened road surface.

(*c*) The lightening of the frame (which is now made of solid metal).

I feel remiss in sending this note on an article possessed of limitations of usefulness. My only excuse for doing so is that the idea may have some interest for others.

July 9, 1915.

FURTHER NOTE ON A CASE OF FIBRO-SARCOMA FOUR YEARS AFTER OPERATION.

By A. Yale Massey, M.D., C.M.
Lusambo, Belgian Congo.

In this Journal of October 1, 1913, I published, with photograph, a case of fibro-sarcoma weighing 900 grm. which I had removed from the back of an adult African native. I mentioned that after eighteen months there was no indication of any return of the tumour. Six months ago—that is, three and a half years after operation—I found that about ten small nodules, varying in size from a pea to a hazel-nut, had appeared on the lower margin of the scar. The scar was about the size of a man's hand. A few days ago I saw the patient again, and two of the nodules had grown to the size of walnuts. The nodules still confine themselves to the lower margin of the scar—that is, to about one-sixth of the circumference, the remaining five-sixths being perfectly healthy and normal. The patient is in robust health. The skin over the nodules is very thin and easily broken, causing bleeding.

Lusambo,
May 10, 1915.

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THE JOURNAL OF
Tropical Medicine and Hygiene
August 16, 1915.

PREVENTION OF SCARLET FEVER AND MEASLES BY THE MILNE METHOD.

Dr. Robert Milne has for many years advocated a method of preventive treatment for scarlet fever and measles which is so distinct a departure from traditional methods that, like most innovations, it has met with opposition, but more, perhaps, of a negative than of a positive nature. Whatever is the cause, however, the method has not been as widely

adopted as the claims for its acceptance would seem to justify. No one can read Dr. Milne's clear statements without being convinced of the honesty and scientific accuracy of his observations.

The means of transmission of so many diseases have been so carefully traced and proved by tropical observers that Dr. Milne's train of thought and prophylactic steps will commend themselves to those who have knowledge of the spread of disease in warm climates. Hitherto our only public attempt to arrest the spread of disease is by isolating the infected by placing them in "fever hospitals." In Britain, cases of small-pox, scarlet fever, and diphtheria are segregated, whereas others, such as measles, chicken-pox, whooping-cough, and mumps are allowed to remain in their own homes, where certain prophylactic steps may or may not be taken to arrest the disease spreading.

In connection with this distinction by the public authority of diseases to be isolated, it may well be said it has no scientific basis. Measles, for instance, causes more deaths in Britain than all the other infectious diseases put together and yet is not even a notifiable disease. Again, the protection afforded to the public by "fever hospitals" has yet to be proved, for in no instance has it been shown that these infectious ailments have diminished because of the introduction of these hospitals. Some observers seem to point to the opposite conclusion, so that to take the middle position and to say that no very apparent good has been done by isolation is well within the truth.

It is when medical opinion is in this position that Dr. Milne steps in and claims for early prophylactic measures a ready, simple, and safe means of prevention in scarlet fever and measles. He holds that by disinfecting the mouth and fauces by frequent washings and moppings and by covering the skin with eucalyptus oil a child with measles or with scarlet fever is rendered non-infective to other children in the home, in the same room or ward, or even in the same bed. He gives instance after instance of protection afforded by these measures; of children in the same ward with several cases of scarlet fever remaining free from the disease, although they have never had the natural protection afforded by previous attacks. Other capable observers, following Dr. Milne's methods, testify to the efficacy of his suggestions; nor has anyone ever cast any doubt as to the accuracy of his statements, nor refuted his conclusions. Such being the case, how is it that the plan is not generally adopted? There are many reasons: First and foremost is the fact that it is an innovation; that it is upsetting preconceived notions; that it renders null and void the recommendations of earlier sanitarians who considered isolation in special hospitals as *the* means and the only means by which diminution in the spread of such fevers could be hoped for. That they have proved abortive we are just beginning to understand, but as it takes a long time to allay an insinuation, so it will be years before we can get away from the fetish of isolation as being the only recognized means of eliminating or to some extent reducing infection. We have, unfortunately, many instances of a similar kind in the history of medicine. When Manson showed that the mosquito was the only means by which filarial disease could be spread, the scientific world laughed, and he was regarded by many as not quite sane, and even by those who believed in his observation the fact was regarded as of mere academic interest. When again he brought forward the observation that malaria was also conveyed by a mosquito, old tropical practitioners were heard to observe "as soon try to keep off malaria by a five-barred gate as by attempting to allay the great scourge by protection from mosquitoes."

It was ever thus, and it was thus in regard to tropical ailments for a time. Now we are rushing to, perhaps, the opposite extreme, and when anyone publishes an observation in regard to an ailment being spread by an insect or by some verminous animal, we are perhaps all too apt to accept it and consider the matter settled.

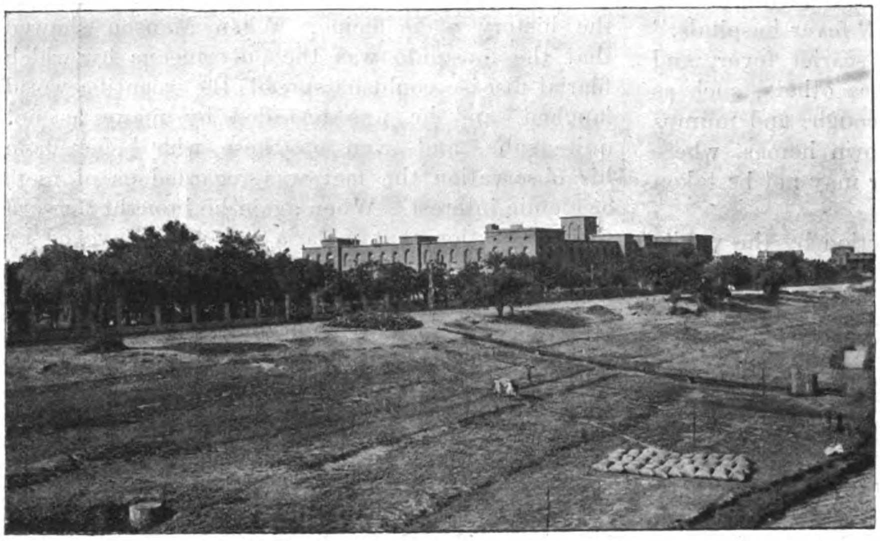
How does Dr. Milne's plan arrest the disease? Do the germs leaving the body of infected persons directly infect others, or are they carried by some insect or by some animal of the class we term vermin? Does the eucalyptus oil act as a germicide or as an insecticide? These are points which Dr. Milne has not touched upon and no doubt leaves it to others to elucidate; he merely points out the fact. Experience always precedes scientific investigation. The mosquito net was used before the mosquito-malaria theory was proved. Oil has been applied to the skin in small-pox and scarlet fever before the germ theory was formulated, and Dr. Milne's eucalyptus process has been brought forward whilst the knowledge as to how the germs spread is yet in abeyance. We would commend this question to our epidemiologists. We require a Sambon to take up the question and to investigate the spread of measles and of scarlet fever as he has dealt with many other problems of a similarly intricate nature.

Meantime we would beg that the absence of scientific proof should not interfere with the greater proof in all instances, namely, experience; and we would urge the practical application, even on an empiric basis, of Dr. Milne's pronouncements, and leave the proof of how disease spreads until such time as the laboratory authorities see fit to explain what experience has taught as to the "home treatment of measles and scarlet fever."

THE WELLCOME TROPICAL RESEARCH LABORATORIES, KHARTOUM, ANGLO-EGYPTIAN SUDAN.[1]

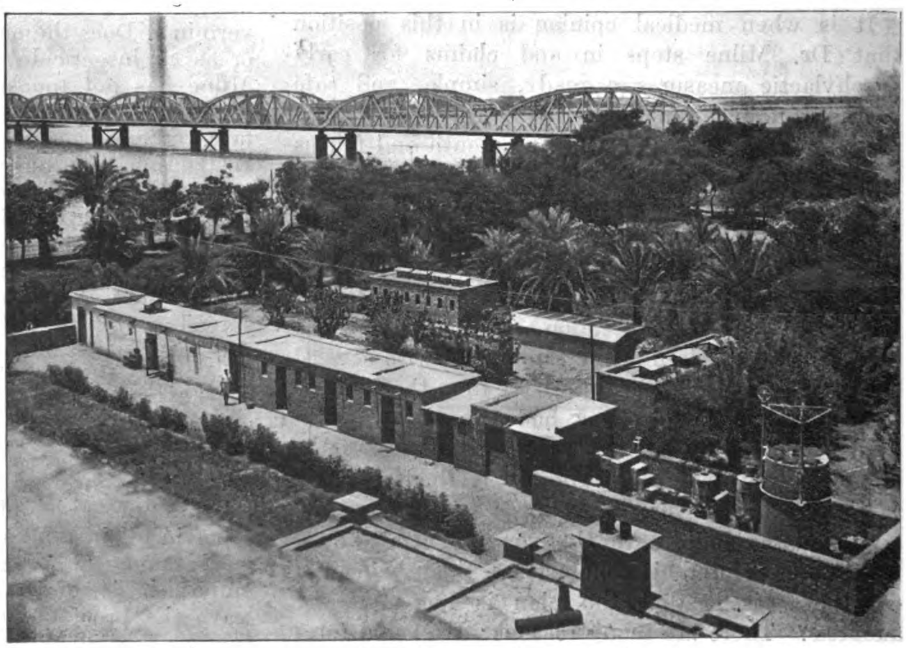
By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories.

THE Wellcome Tropical Research Laboratories, situate in the Gordon College, owe their origin, in January, 1903, to the combined efforts of The Right Honourable Field Marshal Earl Kitchener of Khartoum, His Excellency General Sir Reginald Wingate, G.C.B., Mr. James Currie, C.M.G., and Mr. Henry S. Wellcome. The last-mentioned gentleman most generously presented the original equipment to the Government of the Anglo-Egyptian Sudan to which the Laboratories belong. Mr. Wellcome's kindness to and interest in the Laboratories have not been confined to furnishing the original equipment, as he refurnished them after the disastrous fire in 1908. In addition he has provided funds for the four reports and the two reviews so far published, and this year has given a sum of money for partial re-equipment. The first director, Dr. Andrew Balfour, C.M.G., reached Khartoum in January, 1903, and in his own words "found that everything connected with the Laboratories was in a very backward condition. The rooms were not nearly ready and much of the equipment had yet to arrive." From this condition he raised the Laboratories to the position which they at present occupy in the world of Tropical Medicine and Science, and brought out the four reports already mentioned, together with a large number of original papers, before he retired in April, 1913, after more than ten years of strenuous and most successful toil. In this work he was ably assisted from the earliest commencement by Dr. Beam, who is still Research Chemist of the Laboratories, and later by Mr. King, who was appointed Entomologist in 1906 and still holds this post. In 1908 Captain Archibald, R.A.M.C., was appointed Pathologist, and later Captain (now Major) Fry, R.A.M.C., filled the new post of Protozoologist from 1910 to 1912, when he was succeeded by Captain O'Farrell, R.A.M.C. Early in 1913 Mr. Freak was appointed Junior Assistant Chemist, and later in the same year Mr. Wilks, of Caius College, Cambridge, became Senior Assistant Chemist. In addition the Laboratories have been fortunate to secure most excellent



[*Special Photograph by Morhig, Khartoum.*

FIG. 1.—GENERAL VIEW OF THE LABORATORIES AND GORDON COLLEGE.

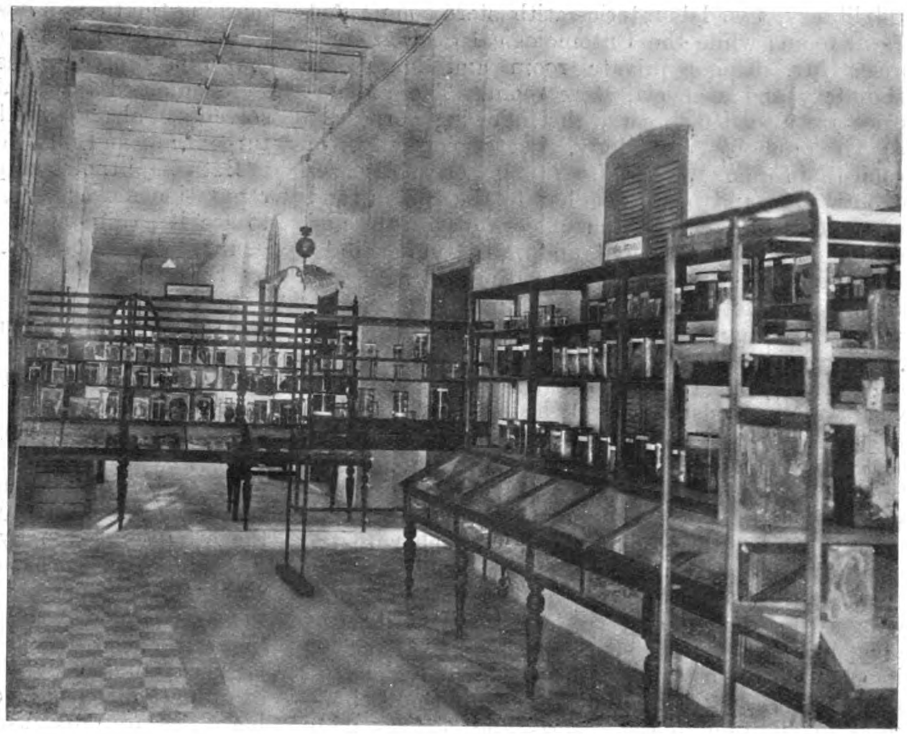


[*Photograph by the Laboratories.*

FIG. 2.—BACTERIOLOGICAL OUT-HOUSES.

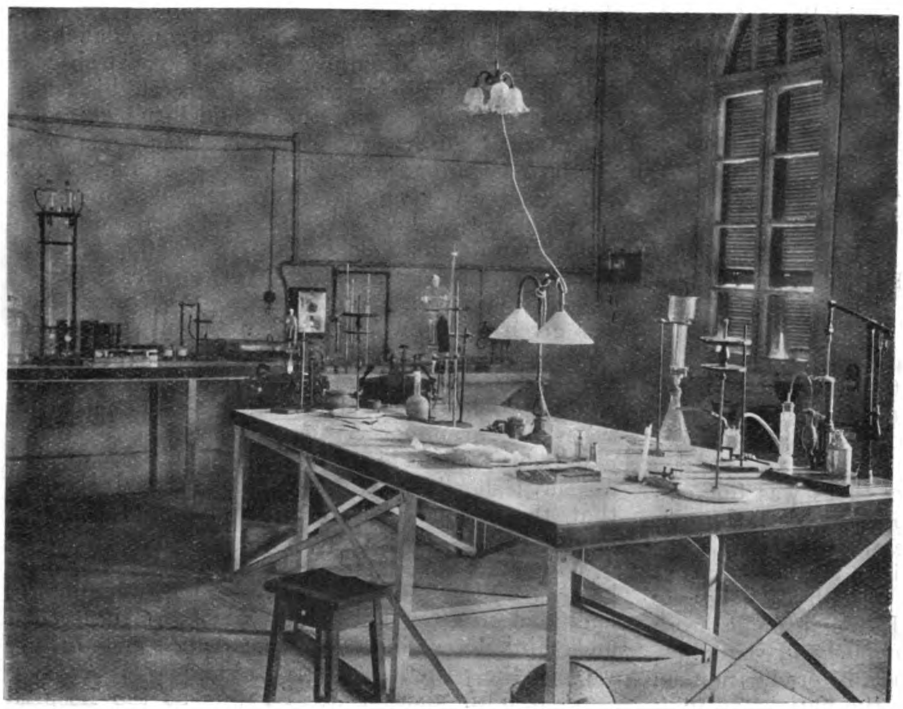
[1] This article was supplied for the "Year Book of Tropical Medicine," but its issue is held up in consequence of the war.

laboratory assistants, among whom may be mentioned Mr. George Buchanan, whose paper on "Developmental Forms of *Trypanosoma brucei*" was published in the *Proceedings of the Royal Society* for 1911 and who is now studying Medicine. He was succeeded by Mr. Alexander Marshall, who has already begun research work. Two new Laboratory Assistants started their work in 1914, viz., Mr. Cottam as Entomological, and Mr. Macdonald as Junior Bacteriological Laboratory Assistants. The above officials and a number of native servants complete the Staff of the Laboratories. The general appearance of the east wing of the Gordon College in which the Laboratories are situate may be judged from fig. 1, and the nature of the Bacteriological Out-houses from fig. 2. The Chemical and Entomological Out-houses are not depicted. The appearance of the main corridor, which in part serves as a Pathological Museum, can be realized by a study of fig. 3, and a typical room is illustrated by fig. 4, which represents the sterilizing and media preparation room of the Bacteriological Section. The whole Laboratory is divided into Bacteriological, Chemical, and Entomological Sections. The first-named consists of a Director's Office, library, and private laboratory, a main office, a media preparation room, a general laboratory, an incubator room and separate private laboratories for Captain Archibald and Captain O'Farrell. In the latter's room is situate the accommodation for a working visitor. There are also photographic and microphotographic rooms, storerooms and out-houses. The Chemical Section consists of Dr. Beam's private room



[*Special Photograph by Morhig, Khartoum.*

FIG. 3.—THE MAIN CORRIDOR AND PATHOLOGICAL MUSEUM.



[*Special Photograph by Morhig, Khartoum.*

FIG. 4.—THE STERILIZING AND MEDIA PREPARATION ROOM.

and library, two laboratories with store rooms and a still room; while the Entomological Section comprises Mr. King's private room and library, a laboratory and a special store room. The Laboratories are intended to serve the following purposes: (*a*) To promote the study, bacteriologically, of tropical disorders, especially the infective diseases of both man and beast peculiar to the Sudan, and to render assistance to the officers of health, and to the clinics of the civil and military hospitals. (*b*) To aid experimental investigations in poisoning cases by the detection and experimental determination of toxic agents, particularly the obscure potent substances employed by the natives. (*c*) To carry out chemical and bacteriological tests in connection with water, foodstuffs, and health and sanitary matters as may be found desirable. (*d*) To undertake the testing and assaying of agricultural, mineral and other substances of practical interest in the industrial development of the Sudan. In order to bring the Laboratories into touch with the out-stations, use is made of the Nile, which traverses the Sudan from north to south. A steamer with a floating laboratory can be sent to any navigable part of the river, and this enables collections and investigations to be made in regions far from Khartoum. The publications of the Laboratories in addition to the reports and reviews mentioned above are to be found in numerous original papers scattered through medical and scientific journals. It is not possible to complete this short account without drawing the reader's attention to the great debt of gratitude which the Laboratories owe to Earl Kitchener, Sir Reginald Wingate, and Mr. Currie for their continued interest in its welfare and for the efforts they have made to promote its success.

Abstracts.

BETA-NAPHTHOL POISONING DURING THE TREATMENT OF ANKYLOSTOMIASIS.[1]

By W. B. Orme.

An obvious case of the above condition has recently been inquired into at Sandakan, British North Borneo, and being only one of a series coming under the writer's notice the time is apparently ripe for a word of warning.

Looking back seventeen years there was but one drug on which reliance was placed, viz., thymol, introduced by Bozzolo in the early 'eighties.

In 1887 Dr. F. M. Sandwith, of Cairo, began treating his cases successfully with thymol, having previously had nothing but disappointment from the male-fern and santonin previously in vogue.

In 1898 the routine method of eradication in Egyptian hospitals was to place the patient on milk diet for a whole day, on the evening of which he was dosed with 1 grm. of thymol; early the next morning the thymol dose was repeated, and followed at 8 a.m. by 30 grm. of Epsom salts.

Ordinary precautions were taken. All patients were enjoined to remain absolutely prone, and the solvents, alcohol, ether, chloroform, glycerine, turpentine, and oils were naturally avoided.

Beta naphthol was particularly welcomed, as by reputation it was safe, and in 1911 it was common to see it exhibited in the Federated Malay States in three doses of 20 gr. each, preceded and followed by Epsom salts.

In these 20 gr. doses thousands of cases were treated with, in the writer's memory, but one fatal case occurring.

Of late, however, it has become the fashion to use it in enhanced doses, three portions of 30 gr. each being quite usual, and even larger being exhibited by some.

These large doses one is inclined to deprecate as routine administered by dressers in native hospitals; the attention given by the qualified man is bound in such to be, in the majority of cases, supervisory rather than personal, and as the fatal case about to be recorded was obviously one in which the medical officer would have reduced the dose had he been able to give the patient a careful personal examination, one can only express the opinion that big doses are only justifiable when given under the immediate care of a qualified man who can afford time to see the patient two or three times daily.

Two other fatal cases have come under notice; though, unfortunately, in these cases notes were not recorded, both resembled the present case very closely.

Luh Tian, a Chinese male, aged 28, on August 25, 1914, was admitted to hospital for a trivial abscess on the knee, and being somewhat anæmic his fæces were examined for ova, the result being recorded as follows: Ankylostomum ova, Clonorchis ova, *Trichuris trichiura* ova. The same evening 5 gr. of calomel was given.

On August 28 half an ounce of Epsom salts was administered, and followed at 7 a.m., 9 a.m., and 11 a.m. the following day by 30 gr. of beta-naphthol on each occasion. Another dose of Epsom salts was given at 1 p.m., and the resulting stool found to contain seven ankylostoma.

The next day, August 30, the treatment was ordered to be repeated, Epsom salts being given the same evening. At 7 a.m. on the 31st the patient was given his first dose of the beta-naphthol mixture; shortly after he commenced vomiting, so that the second and third doses were not administered.

When the dresser has finished his morning duty he leaves; the second and third doses were left in charge of an attendant, who did not give the second and third doses, but did not call attention in any way to the patient.

At 6 p.m. another dresser was at the hospital and recorded the patient's temperature as 102·8° F. On the morning of September 1 the fever had fallen to 99° F., but vomiting continued, the urine became extremely dark in colour, and slight jaundice showed

[1] Abstracted from the *Indian Medical Gazette*, June, 1915.

itself. During the morning he was seen by the medical officer and found in a collapsed condition, so much so that $\frac{1}{30}$ gr. of strychnine was ordered at 11 a.m., 4 p.m., and 9 p.m. The temperature in the evening, however, again rose to 101° F., and in the early hours on September 2 the patient died.

Before treatment the urine was: sp. gr. 1010, acid, with cloud of albumin. Albumin was also found in the other fatal cases mentioned above.

[The standard treatment with beta-naphthol is 30 gr. in three doses of 10 gr. each; not to be repeated within the week, and not to be given when there is albuminuria.—ED.]

The liver weighed 3 lb. 5 oz., was deep yellow in colour, and contained numerous *Clonorchis sinensis*. The right and left kidneys weighed respectively 4 and 5 oz., and on section showed a rather narrow cortex, though the capsule stripped fairly readily without tearing the tissue beneath. The section had a somewhat fatty appearance, but the most characteristic feature was the colour, which had much of the aspect of the liver itself, though not so deeply stained. There was no congestion, the cut surface being quite dry.

Some urine which was removed *post mortem* was very dark, apparently partly due to bile and partly to the beta-naphthol. Albumin was present in large amount.

Microscopic examination showed a quantity of *débris* and a few scattered red blood cells. No spectroscopic examination was made.

Looking back on these cases, there can be no doubt that in those individuals suffering from diseases of the kidneys beta-naphthol should be used with the utmost caution, if at all; certainly not in the heroic doses at present in fashion.

Probably it would also be wise to go back to the rule of leaving an interval of a full week between any two treatments.

Dr. Ferguson (British Guiana) treats ankylostomiasis by administering a cachet containing 10 gr. of thymol every night for a period of many weeks.

In discussing the probable advantage of the above method of treatment over that in general use, with several medical men in British North Borneo, it appeared to be generally held that such a course of thymol would in a large percentage of cases damage the kidneys. Whereas Dr. Ferguson says: "This long-continued course of thymol produced no ill-effect whatever and cured the disease completely."

It would be highly interesting if any medical men having experience of this treatment would publish their results in THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, paying special attention to the points raised.

One more observation, which may be interesting to those in charge of hospitals in the Tropics, is that, in the writer's experience, whereas in *Necator* infection one treatment is usually sufficient to dislodge all the worms, in infection with *Ankylostoma duodenale* three are generally necessary. Can it be that the more formidable mouth-parts of the latter are responsible for this difference?

ZOOPARASITIC INTESTINAL INFECTIONS.[1]

By C. W. STILES.

Professor of Zoology.

THE city of X. is located in the coastal area of one of the Gulf-Atlantic States and has a population of about 30,000 inhabitants, among whom the whites outnumber the negroes.

WHITE PUPILS.

Of the total 2,448 white pupils, 776 (446 boys, 330 girls) submitted fecal specimens for microscopic examination. These represent 31·7 per cent. of the total number (37·51 per cent. of the boys, 26·21 per cent. of the girls).

Of the total 776 pupils (446 boys, 330 girls) who furnished specimens, a total of 491 (63·27 per cent.) (250 boys, 56·05 per cent. and 241 girls, 73·03 per cent.) showed no infection with intestinal protozoa, or worms, while a total of 285 (36·73 per cent.) (196 boys, 43·95 per cent.; 89 girls, 26·97 per cent.) showed infection. Thus it is seen that the infection among the boys (43·95 per cent.) was distinctly higher than that (26·97 per cent.) among the girls.

Unconscious coprophagia.—The parasites found may be classified in two larger biological groups, from the standpoint of method of infection.

Infections with certain protoza (*Endamœba, Lamblia, Trichomonas*), and round worms (*Ascaris* or the eel worm, *Oxyuris* or the pin worm, and *Trichuris* or the whip worm) are contracted by swallowing the germs contained in human excrement, and in no other way.

These germs, which are spread by permitting the excrement to be disseminated by flies, by dogs, by chicken, &c., finally reach the mouth through infected food, infected water, soiled fingers, or by putting into the mouth other objects soiled by the scattered excreta.

Infections with *Necator* (hookworm) can be contracted through the skin, as well as by the mouth; while the infection with the dwarf tapeworm (*Hymenolepis nana*) is probably contracted only through the mouth, it is possibly still an open question whether this is done by swallowing human excrement containing the eggs, or by swallowing an insect that acts as intermediate host.

Of the total 776 children examined, a total of 218 (28·09 per cent.), (153 boys, 34·30 per cent.; 65 girls, 19·70 per cent.) clearly obtained infections by swallowing human excrement.

These figures indicate that white boys swallow more human excrement than do white girls, and if the statistics are studied for double and triple infections in boys as compared with girls, this conclusion is more than confirmed (total 177 infections in 446 boys as compared with 66 infections in 330 girls).

Moreover, the proof is present that these 218 children obtained a total of 243 infections in this

[1] Abstracted from United States Public Health Reports, July 2, 1915.

TABLE I.—TABLE OF INTESTINAL PARASITES FOUND AMONG THE SCHOOL CHILDREN OF THE CITY OF X.

White (6 to 17·75 years, inclusive).

	Number of persons examined	Persons negative		Persons infected		Percentage of persons found infected with parasites																			
						Infections due solely to swallowing human excrement														Infections not necessarily due to swallowing human excrement					
						Total		Endamœba		Lamblia		Trichomonas		Ascaris		Oxyuris		Trichuris		Total		Hymen. nana		Necator	
		Number	Per cent.	Total number	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.	Number of persons	Per cent.
Girls ..	330	241	73·03	89	26·97	65	19·70	22	6·67	28	8·48	1	0·30	12	3·64	2	0·60	1	0·30	29	8·79	1	0·30	28	8·48
Boys ..	446	250	56·05	196	43·95	153	34·30	46	10·31	71	15·92	4	0·90	46	10·31	1	0·22	9	2·02	56	12·56	1	0·22	55	12·53
Negro (approximately 6 to 18 years, inclusive).																									
Girls ..	285	143	50·18	142	49·82	139	48·77	36	12·63	18	6·32	..	..	81	28·42	..	..	31	10·88	14	4·91	1	0·35	13	4·56
Boys ..	226	117	51·77	109	48·23	107	47·34	25	11·06	15	6·64	..	..	62	27·43	..	..	28	12·38	4	1·77	..	..	4	1·77

manner, as compared with 85 infections which they might have obtained in some other way.

All of the 328 infections in 285 of the 776 children examined are traceable directly to the fact that in the surroundings in which the school children have been living, or by which their life is influenced, human excrement has not been disposed of in a safe and proper manner, but has been permitted to come into contact with their bodies and with their food and drink.

The total infection with *Endamœba coli* was 0·9 per cent. greater at sewered homes than at privy homes.

With *Lamblia*, the total infection was 3·13 per cent. greater at privy homes than at sewered homes.

With *Trichomonas*, the infection was 1·10 per cent. greater at privy homes than at sewered homes.

With *Ascaris lumbricoides*, the infection was 2·61 per cent. greater at privy homes than at sewered homes.

With *Oxyuris vermicularis*, the infection was 0·33 per cent. greater at sewered homes than at privy homes.

With *Trichuris trichiura*, the infection was 1·56 per cent. greater at privy homes than at sewered homes.

Infections not necessarily obtained through coprophagia.—Only two children showed infection with the dwarf tapeworm, *Hymenolepis nana*. Both of these pupils live at sewered homes.

Of the total 776 children examined, 83 pupils (10·69 per cent.) showed infection with hookworms. Despite the fact that these are city school children, this infection is greater than that shown by the rural school children in some of the clay-land counties.

It is scarcely to be assumed that all of these hookworm children became infected at their homes. Some of them doubtless obtained the infection at their neighbours', some out in the rural districts. Nevertheless, the percentage preponderance of hookworm children at privy homes is very striking, and since hookworm infection may be a retarding influence in both physical and mental development, we must not be surprised if the tabulations show that the hookworm children affect the averages of the children in some of the physical and mental tests that were made.

Multiple infections.—In 39 children (33 boys, 6 girls) double infections were found; in 3 children (all boys) triple infections were found. The number of triple infections is too low to use statistically.

NEGRO PUPILS.

It was much more difficult to obtain definite ages for the negroes than for the whites, and a much larger percentage of the negro children had to be rejected because of this fact. Any classification of a large number of negro children on age basis can at present be only approximate. Accordingly, the negro pupils included in this tabulation correspond only approximately to the white pupils, namely, 6 to 18 years old, inclusive, and one additional year (18 years old)

is inserted for the negroes in order partially to balance the inaccurate data regarding age.

Of the total 1,346 negro pupils, 511 (226 boys, 285 girls) submitted specimens for microscopic examination. These represent 37·96 per cent. of the total number (42·01 per cent. of the boys, 35·27 per cent. of the girls).

Of the total 511 negro pupils (226 boys, 285 girls) who furnished specimens, a total of 260 (50·88 per cent.) (117 boys, 51·77 per cent., and 143 girls, 50·18 per cent.) showed no infection with intestinal protozoa or worms, while a total of 251 (49·12 per cent.) (109 boys, 48·23 per cent., and 142 girls, 49·82 per cent.) showed infection.

Unconscious coprophagia.—Of the total 511 negro children examined, a total of 246 (48·14 per cent.) (107 boys, 47·34 per cent., and 139 girls, 48·77 per cent.) clearly obtained infections from swallowing human excrement. The difference between the boys and girls is less than 1 per cent., and indicates that negro boys and negro girls are practically equal in this respect.

Moreover, the proof is present that these 246 negro children obtained 296 infections in this way, as compared with 18 infections which they might have obtained in some other manner.

Endamœba coli was present more frequently (by 4·63 per cent.) among children of sewered homes than among children at privy homes.

Lamblia was present more frequently (by 2·45 per cent.) at privy homes than at sewered homes.

Ascaris lumbricoides was present more frequently (by 8·89 per cent.) at privy homes than at sewered homes.

Trichuris was present in practically the same proportion at sewered homes and at privy homes.

Infections not necessarily obtained through coprophagia.—*Hymenolepis nana* was found only once.

Hookworms were found only 17 times and in slightly greater frequency (by 1·18 per cent.) at the sewered homes.

Multiple infections.—In 52 children (21 boys, 31 girls) double infections were found; in 4 children (2 boys, 2 girls) triple infections were found; in 1 girl quadruple infection was found. The triple and quadruple infections are too few to be used statistically. The number of double infections is also rather low for statistical comparison, but it may be remarked that double infections were present in 9·72 per cent. of the children at privy homes, as compared with 13·44 per cent. of the children at sewered homes.

General Discussion, with Comparison of White and Negro Children.

It is a matter of common knowledge that the white families live in better sanitary environment than do the negroes. This condition is due to a better economic status, to better education, and to higher standards. This common knowledge is reduced to a statistical basis in the present study, which shows that 20·22 per cent. of the white pupils of the city of X live at privy homes, as compared with 76·46 per cent. of the negro pupils.

Popular opinion is to the effect that it is more difficult to obtain co-operation in health matters from the negroes than it is from the whites. This popular view is not entirely in accord with personal experience on a number of occasions, and in this particular study the statistics indicate that a better response was obtained from the negroes than from the whites, as indicated by the fact that 37·96 per cent. of the negro children furnished specimens as compared with 31·7 per cent. of the white children. This indication is subject to the criticism that a greater proportion of negro children than of white children were eliminated from consideration because of the indefiniteness of their age. Undoubtedly the white children, especially the girls, are more influenced by a feeling of modesty than are the negro children, when it comes to submitting specimens for examination. Nevertheless, it is well to recall that, notwithstanding the greater proportion of ignorance among the negroes, it is by no means so hopeless a matter to obtain their co-operation in a public health movement as is frequently supposed. Results will vary with conditions and in different localities, but they will vary especially with the methods adopted by the person who is seeking to enlist their interest.

Corresponding to the poorer grade of sanitary environment under which the negroes live, as compared with the whites, and corresponding to their lower standards in general, theory indicates that they may be expected to show a higher incidence of infection with certain species of intestinal parasites. The present studies tend to confirm this expectation, as is seen from the statistics of 49·12 per cent. of the negroes, as compared with 36·73 per cent. of the whites, for total number of pupils infected, and 48·14 per cent. of the negroes, as compared with 28·09 per cent. for the whites, as index of infections that could have been obtained only by the actual swallowing of human excrement, and in no other way.

Notes and News.

PELLAGRA.

In a bulletin recently issued by the Mississippi State Board of Health, it is said that 10,954 cases of pellagra were reported to that body in 1914 by county health officers. There were 6,991 in 1913. Though a portion of this increase is thought to be due to better reporting, it is believed that the disease is rapidly increasing in the State. There were 1,192 deaths in 1914 from this disease, as compared with 795 for 1913, although the number of deaths from all causes was about the same in the two years. The death-rate for 1914 was said to be 62·7 per 100,000, as against 42·4 for 1913, an increase of over 47 per cent. The pellagra mortality, based on the number

of deaths from all causes, was 10·9 per cent. It is recommended in the bulletin that the dietetic theory of the United States Public Health Service as to the etiology of pellagra be accepted and treatment carried out along the lines suggested by the service.

STUDY OF THE PLACENTAL BLOOD.

IN the Board of Health laboratory of the Canal Zone (April Report), studies were made of the placental blood-film in cases in which there was a possibility of estivo-autumnal malaria being associated with pregnancy and the puerperium. From these studies it was decided that the placental blood-film made from the maternal surface of the placenta immediately after labour possesses important diagnostic value, because, from the third month on, the placenta becomes even a better medium for the location of this parasite than the peripheral blood; in many cases it will show the parasites when the latter will not. The parasites are more numerous and larger, and the phagocytosis of pigment is much more apparent. In the late stages of pregnancy it is said that the placenta in some of its vascular peculiarities corresponds more nearly to the appearance of the spleen and bone marrow, and therefore offers favourable features for the localization and development of parasites. The examination of films from the placenta will frequently aid in differentiating puerperal sepsis from malaria, and the test might be used as a routine in tropical obstetrics. The pregnant state seems to encourage outbreaks of latent malaria late in the pregnancy, and also predisposes the individual to primary infection when exposed to malaria. It is not believed that congenital malaria ever occurs without some associated accident of pregnancy, such as injury to the placenta.

HEAVY ATHLETICS.

THE college strong man often dies in middle life. The long-distance runner, the great-chested rower, the prize-fighter, usually die young, frequently from tuberculosis or some other disease associated with lowered resistance. Heavy athletics are pernicious. They have no place in hygienic exercise. The after effects of severe exertion are harmful. An enlarged heart is not a safe organ; a greatly increased lung capacity is not only useless but dangerous in later life.—*Public Health Reports*, May 7, 1915.

Personal Notes.

INDIA OFFICE.

From May 27 to August 3, 1915.

Arrivals reported in London.—Major J. C. Robertson, C.I.E., I.M.S.; Lieutenant-Colonel L. F. Childe, I.M.S.; Colonel D. St. J. Grant, I.M.S.; Captain M. L. A. Gompertz, 108th Infantry; Captain J. McD. Eckstein, I.M.S.; Lieutenant-Colonel F. E. Swinton, I.M.S.

Extensions of Leave.—Major C. B. Harrison, I.M.S., to July 30, 1915, M.C.; Major A. T. Pridham, I.M.S., to October 8, 1915, M.C.; Lieutenant-Colonel F. W. Gee, I.M.S., 3 m., M.C.; Major W. C. Long, I.M.S., 3 m., M.C.; Major J. G., Robb, I.M.S., 3 m., M.C.; Lieutenant-Colonel E. E. Waters, I.M.S., 3 m., M.C.; Major W. G. Richards, I.M.S., 3 m., M.C.; Lieutenant-Colonel H. B. Melville, I.M.S., 6 m., M.C.; Lieutenant Colonel G. S. Thompson, I.M.S., 2 m., M.C.; Captain J. D. Sandes, I.M.S., 1 m., M.C.; Lieutenant J. D. Wilcox, I.M.S., 4 m., M.C.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment or Department, and the Period for which the Leave was granted.

Gee, Lieutenant-Colonel F. W., I.M.S., to June 22, 1915.
Harrison, Major C. B., I.M.S., to July 30, 1915.
McWalters, Captain M. R. C., I.M.S.
Pridham, Major A. T., I.M.S., to October 5, 1915.
Robb, Major J. T., I.M.S., to August 11, 1915.
Wilson, Lieutenant J. D., I.M.S., to September 16, 1915.
Childe, Lieutenant-Colonel L. F., I.M.S., to November 17, 1915.
Eckstein, Captain J. McD., I.M.S.
Grant, Colonel D. St. J., I.M.S., to November 21, 1915.
Swinton, Lieutenant-Colonel F. E., I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Cox, Major W. H., D.S.O., I.M.S., Burma, 24 m., April 12, 1913.
Harrison, Major C. B., I.M.S., Ms., 13 m, 24 d., June 7, 1914.
Long, Major W. C., I.M.S., Ms., 6 m., January 9, 1915.
Melville, Lieutenant-Colonel H. B., I.M.S., Delhi, 17 m., April 1, 1914.
Childe, Lieutenant-Colonel L. F., I.M.S., 7 m., April 18, 1915.
Hare, Lieutenant-Colonel E. C., I.M.S., Bihar and Orissa Sanitary Commission, 6 m., May 17, 1915.
MacLeod, Lieutenant-Colonel E. C., I.M.S., Assam, 19 m., March 16, 1915.
Richards, Major W. G., I.M.S., Ms., 15 m., August 29, 1914.
Robertson, Major J. C., C.I.E., I.M.S., India Sanitary Commission, 8 m., April 14, 1915.
Waters, Lieutenant Colonel E. C., I.M.S., Bl., 15 m., September 26, 1914.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

Deaths.—F. J. A. Baldwin, M.R.C.S.Eng., L.R.C.P.Lond.; A. W. H. Grant, L.M.S.S.A.Lond.; J. A. Beattie, M.D.,Ch.B. Aberd.

Transfers and Promotions.—J. A. Clough, M.B.Lond., Provincial Medical Officer, Gold Coast, has been transferred on promotion to Nigeria as Deputy Principal Medical Officer. M. E. O'Dea, M.B., Ch.B.Edin., Senior Medical Officer, Nigeria, has been transferred on promotion to the Gold Coast as Provincial Medical Officer.

Retirements.—C. R. Chichester, M.B.Dublin, D.P.H.Ireland, Deputy Principal Medical Officer, Nigeria, retires on pension; F. W. McCay, L.R.C.S., L.R.C.P.Edin., L.F.P.S.Glas., appointment terminated.

New Appointment.—A. C. N. McHattie (late Chief Medical Officer, Bahamas), Medical Officer, Nigeria.

Re-employment.—E. E. Maples, M.D., B.S Lond., F.R.C.S. Eng., L.R.C.P.Lond., Medical Officer, Nigeria.

Other Colonial Medical Appointments.—F. Mahabir, M.R.C.S.Eng., L.R.C.P.Lond, appointed Supernumerary Medical Officer, Trinidad, and seconded for service as Assistant Medical Superintendent in the Lunatic Asylum. J. C. McNaughton, M.D., C.M., M.R.C.P.Edin., Medical Officer, Gilbert and Ellice Islands Protectorate. R. P. Weldon, L.R.C.S., L.R.C.P.Ireland, Supernumerary Medical Officer, Trinidad. H. R. Maclurkin, M.B., Ch.B.Glas., D.P.H., R.C.P.S.Edin., Medical Officer, Fiji. N. H. Brewster, L.R.C.S., L.R.C.P.Edin., L.F.P.S.Glas., Supernumerary Medical Officer, Trinidad. H. W. Bell, M.B., Ch.B.Edin., Medical Officer, Weihaiwei. J. S. O'Sullivan, M.B., B.Ch., B.A.O.(N.U.T)., Medical Officer, Solomon Islands. H. W. L. Waller, M.B., Ch.B.Liverpool, Medical Officer, Zanzibar Protectorate. W. L. Peacock, M.B., Ch.B.Glas., Temporary Medical Officer, Uganda Protectorate.

Original Communications.

NOTES ON THE REARING OF *STEGOMYIA FASCIATA* IN LONDON.

By Malcolm Evan MacGregor.

Wellcome Bureau of Scientific Research.

In May of this year the Bureau was presented by Sir James Kingston Fowler, Chairman of the Yellow Fever Commission, with a few dried leaves of the West African cotton-wood tree, on which were eggs of *Stegomyia fasciata*, these having been sent to the Colonial Office by Mr. A. W. Bacot from West Africa (Sierra Leone).

The leaves had been a fortnight in transit and had remained at the Colonial Office for three months, being thus, at the very least, three and a half months in a dried condition ere they reached my hands, while from what I hear they may very probably have been dried for a considerably longer period. These leaves were packed between grease-proof paper in a small cardboard box, and were in a thoroughly desiccated state.

On examination under the binocular microscope I found a fairly large number of eggs adhering to the leaves, for the most part secured by a fine deposit of dried mud.

About 75 per cent. of the eggs were apparently dried up with their shells crinkled and shrivelled, while the rest looked normal. I therefore examined specimens of both by breaking them open with needles and found them to contain moisture and partly formed larvæ.

The leaves were then cut up into pieces about 1 in. square and placed on tap-water in glass containers and kept at the temperature of the laboratory (18° C.). This was done at 11.30 a.m. on April 29, and by 9.30 a.m. the next day the water was crowded with larvæ, that had hatched out in such numbers as to leave me in no doubt that the shrivelled eggs, as well as the normal, had been viable.

Larval Food Supply.

This first generation of larvæ was divided into approximately equal numbers and placed in separate containers: No. 1 containing tap-water contaminated with straws from horse manure and the organic matter and bacteria thereon: No. 2 containing fresh water from the Serpentine Lake in Hyde Park. Both containers were then placed under equal conditions of light and temperature. Four days later the larvæ in container No. 1 had grown and greatly increased in size, while those in container No. 2 appeared to have hardly grown at all, and were moreover sluggish in their movements compared with the former. The waters of both containers, together with the respective larvæ, were therefore then mixed and more straws from the horse manure added.

Optimum Temperature with given Food Supply.

To determine the optimum temperature with the above food supply for rearing the larvæ in the laboratory, eight lots of twenty larvæ, of as nearly as possible one size, were placed in eight small beakers, together with equal supplies of water from the main container.

These beakers were arranged along a copper sheet, heated by a small Bunsen flame at one end, at varying distances from the heated end, and when the temperature of the water in each beaker had become constant, it stood as follows:—

No. 1.	16° C.	No. 4.	25·9° C.	No. 7.	37° C.
No. 2.	19·5° C.	No. 5.	30·8° C.	No. 8.	41·4° C.
No. 3.	23·8° C.	No. 6.	35·2° C.		

From the beakers at the higher temperatures evaporation was somewhat rapid, but was compensated for by the addition of tap-water in order to keep the concentration of the food supply also constant. This, obviously, would not have been the case if water from the main container had been used.

In order to avoid a somewhat unwieldy table, giving dates of pupation and emergence of first imagos, &c., the results may be briefly stated as follows.

In beaker No. 4 (temperature 25·9° C.) the larvæ seemed to do best, and the mosquitoes which bred out from this beaker were certainly the largest and strongest specimens. In No. 3 (temperature 23·8° C.) the imagos, when they emerged, were perhaps equally fine specimens, but they were, as an average, three days longer in the complete metamorphosis. At temperatures below this the number of days for the metamorphosis was considerably prolonged. In beaker No. 1 one or two of the larvæ died, and the imagos on emergence were undersized and somewhat feeble. At the higher temperatures, that is, in beakers Nos. 5, 6, and 7, the average date of emergence of the imagos was several days in advance of those in beaker No. 4, and the specimens were very much undersized, though all were active and apparently healthy. The larvæ in beaker No. 8 (temperature 41·4° C.) all died within a day.

Thus it will be seen that with the food supply and the light conditions used the optimum temperature was from 23° to 26° C., and this has been the temperature adopted for the subsequent generations. At this temperature, and with this food supply, the average larval period was ten days, and the average pupal period six.

Males and Females.

On emergence the male and female mosquitoes were transferred to a small cage consisting of a wooden box that had had top and bottom removed and screened with butter-muslin. It was observed that copulation took place almost as soon as the mosquitoes were able to fly, and before any food had been given to them. The mating took place usually in mid-air, and the female was fertilized

as the pair flew slowly about, or, as more often happened, the female immediately settled on the muslin or sides of the cage, and copulation took place there, the male being in a peculiar position with his back and wings pressed against the support on which the female rested, with the abdomen arched upwards.

It was found that the mosquitoes would readily feed on a black guinea-pig, and this has furnished the food supply for the adult females. A black guinea-pig was used because a marked preference was noticed in the mosquitoes for this colour. At one time a white animal was substituted, and the mosquitoes could not be induced to attack it at all readily, even when the hair on the back was shaved; while the one or two that settled and commenced to feed were instantly disturbed by the slightest movement on the guinea-pig's part, and would fly off to the far ends of the cage and remain there.

When the white guinea-pig was removed and a black one put in, the mosquitoes attacked it vigorously, and no amount of persistent endeavour to drive them off that the guinea-pig indulged in was successful. I have noticed partially gorged mosquitoes sitting on the black animal's head, apparently quite oblivious of the most violent head-shaking.

It was also noticed that the mosquitoes, before they had partaken of their first meal of blood, did not attack the guinea-pig in the voracious manner they adopted at subsequent meals, when, as it were, they had "tasted blood."

Length of Life in Males and Females.

Under the conditions that the mosquitoes live at the laboratories it has been found that as an average the males live from ten days to three weeks, while the females live from a month to six weeks, while some are alive still after two and a half months.

Feeding Habits of Female and Oviposition.

An average specimen female will become completely engorged with blood in from three to five minutes, and when replete is so heavy that she can barely fly, and usually prefers to hop off the guinea-pig on to the floor of the cage, and crawl up the sides, taking refuge in the darkest place she can find.

The eggs in the ovaries would seem to require from three to five days in which to become mature after the blood meal, and oviposition was found to have taken place in all cases within this period.

When all the mosquitoes have fed that are inclined to do so, it has been the custom to remove the guinea-pig from the cage and place therein a small Petri dish partially filled with tap-water, or the water used in rearing the larvæ, with a few small leaves floating on the surface.

The eggs are deposited for the most part directly on the surface of the water, but many are also attached to the leaves it is found. In neither case, however, are they laid with much attempt at system, and the best that can be said is that they tend to be deposited in irregular clusters. Apparently the eggs must not be submerged for any length of time before they hatch, and it has been found that water with eggs floating on the surface, when poured from one vessel to another (and the eggs therefore thoroughly wetted), causes the eggs to sink to the bottom and very few larvæ then hatch out.

Individual females have made as many as eight separate ovipositions, and will feed again readily within a day after laying each batch of eggs.

Males.

Careful study of the habits of the male over the period of its life within the cages convinces me that while it does not suck blood as the female does, yet it is very fond of occasionally working its proboscis over the guinea-pig's skin and appears to draw up minute quantities of sweat and saliva from a "licked" part. Males are often also seen resting on the water in the Petri dishes, with the tip of the proboscis submerged, and apparently drinking.

The males are most active in the afternoons, and seem ever ready to mate with females on the wing, but in no instance has it been observed that a male will approach a *resting* female. If the sides of the cage are knocked and the resting mosquitoes made to take to the air, the males immediately unite with the female mosquitoes and copulation may take place while they are both on the wing, or the female will alight and the male be driven against the cage in the peculiar attitude that I have described elsewhere in this paper.

When the guinea-pig is in the cage the males show a marked preference to sitting on it rather than on the sides of the cage, and seem to choose the tips of the ears as a favourite resting place. They will sit there if not disturbed for an hour or more, with the plumes and antennæ at times in rapid vibration.

The Pupæ.

The pupal condition is usually attained during the night, but if the larvæ are kept in a fairly dark place this change can be observed. The fully grown larvæ, which is about to pupate, can be distinguished by its becoming almost opaque, and of a yellowish white colour except for the head; the usual dark line in the larvæ that marks the alimentary track having disappeared. On pupation the larval skin splits open on the dorsal side of the thorax, and with much wriggling the pupa struggles out. This manœuvre is often accomplished at the bottom of the tank, and the withdrawing of the "tail" end seems to occasion the most difficulty, but the change is completed very rapidly indeed—often within 30 secs. When the pupa first emerges it is of the same yellowish-white colour, but in the course of a few hours becomes darker, and the colour of the pupa is a fair indication of the stage it has reached before the emergence of the adult.

The Larvæ.

When first hatched they are about 1 mm. long and 0·3 mm. at greatest breadth, quite white, and rather difficult to see if the container is not placed on a black background. The larvæ grow very rapidly, and in a few hours at a temperature of 25° C. are much larger and more conspicuous by the head having enlarged, and become dark in colour.

For some time it was customary to give the larvæ the food furnished by simply adding a few straws from horse manure to the water; but as one would naturally expect the quantity of food furnished by this means was uncertain, and while it amply sufficed for their needs in some instances, it was insufficient in others. By accident a pellet of the guinea-pig's fæces was added one day, and the larvæ were seen to feed greedily upon it, even in the presence of an abundant supply of other food, and since then guinea-pig's fæces have been regularly added to the water, the larvæ thriving splendidly in consequence.

With the water from the Serpentine Lake that was used in the first experiment, one or two cyclops were introduced, and in the subsequent mixing of the waters descendants have been introduced into all the containers. They do not, however, seem to interfere with the larvæ, nor do the latter appear to attack the cyclops. Nevertheless, that the larvæ like animal food can be demonstrated by adding newly hatched larvæ to the same container that holds well-grown individuals, the young larvæ, even if added in large numbers, being speedily consumed by the others.

It is common knowledge that the larvæ of mosquitoes very readily react to light, and that the larvæ of Stegomyia avoid it and seek the darker places in which to live, except if forced into light when they come to surface to breathe. Mitchell[1] has recorded the fact that some mosquito larvæ also react to what appears to be a sense of smell, and though I have not seen it recorded elsewhere, I find that Stegomyia larvæ apparently react to sound as well. It was noticed that whenever a mercury break, that is attached to an X-ray apparatus in my laboratory, was switched on, the larvæ immediately dived to the bottom of their containers when the high-pitched note that the mercury break emits commenced. The X-ray apparatus and the containers are separated by the length of the laboratory, and are some considerable distance apart, so that it is not due to simple vibration. Thinking that the container might resonate with the note of the break, the larvæ and water were transferred to another vessel possessing a totally different vibration period to the first. However, as before, the larvæ would immediately dive when the note of the break sounded. It was also found that a sharp whistle would make them react in the same way.

Until fully grown the larvæ of Stegomyia are semi-transparent in parts of their bodies, but when about to pupate they cease to feed, and most of the food in the alimentary tract is either digested and absorbed, or excreted, and the larvæ become more opaque and of a yellowish colour, so that individuals about to pupate can be readily distinguished.

[1] "Mosquito Life." By E. G. Mitchell (1907).

The Eggs.

These have been laid in very large numbers about three to five days after the females have fed, and kept at a temperature of 30° C. (which has been found to be the optimum for the development of the eggs under the existing conditions) they have hatched in an average from three to five days. The variation in individual eggs from the same batch in the incubation period is remarkable, however, some being several days longer in hatching than the rest, and in many cases eggs laid at one time by the same female and kept under precisely uniform conditions will hatch out irregularly over a period as long as ten days or a fortnight, for some reason I have not yet been able to determine. It may possibly be a protective provision in Nature to guard against the chance of all the larvæ hatching before a rain or other pool has become established.

Remarks.

Although the rearing of Stegomyia, after the eggs have been desiccated and sent through the post, has been accomplished before by several observers, notably by Theobald, Newstead, Francis, Peryassu, and others,[1] yet, as far as I can determine, the present investigations at the Bureau have succeeded in producing the greatest number of subsequent generations from such eggs, the sixth generation now having been established among my mosquitoes. There has been no loss in the size or vitality of the insects, and it is now hoped that with the apparatus that has been constructed and fitted up in the Museum of the Bureau that a permanent exhibit of the life-history of *Stegomyia fasciata* has been set up for observation by anyone interested in the subject. Similar apparatus is also to be used in an attempt to rear Anophelines and *Culex pipiens* in the same way for comparative purposes.

It had been hoped that experiments might have been undertaken in comparative temperature, experiments, &c., between *Stegomyia fasciata* larvæ and those of *Culex pipiens*, since in the course of my work I was called upon to determine the species of a mosquito that was found breeding in a "sump" pit at the Highgate Station of the Underground Railway, and which turned out to be the latter insect.

These insects were breeding in enormous numbers and situated in the "sump" pit were at a distance of 120 ft. below the ground. The conditions were so extraordinary that I hope to write a brief note on the subject for separate publication.

[1] See "A Text-book of Medical Entomology." By Patton and Cragg.

I was thus enabled, however, to obtain large numbers of larvæ with which I intended to conduct the above-mentioned comparative studies, but they unfortunately speedily died in my laboratory, due, I think, to the fact that they had lived in complete darkness beforehand and could not tolerate the conditions I transferred them to.

Recently, nevertheless, I have obtained large numbers of larvæ of the same mosquito from a different source, and these are living well, so that I hope to be able to conduct the experiments in mind shortly.

It is particularly interesting to record the fact that Dr. A. C. Stevenson, of this Bureau, while engaged in searching for endo-parasites in the Stegomyia larvæ, discovered a very large percentage to be infected with *Lankesteria culicis*. This parasite was first described by Ross in 1898, when he found it in Anophelines in India, and was subsequently found by others, and by Wenyon in *Stegomyia fasciata* larvæ in Bagdad. The parasite has been particularly carefully studied and described by the latter investigator,[1] and a record of the discovery of the parasite in the larvæ I have been working with from West Africa is to be published by him elsewhere in this journal.

By the demonstration once more of the remarkable resistance of the eggs of *S. fasciata* to desiccation, attention is called again to the fact of what this may very easily mean in the distribution of this mosquito, and hence its bearing in the spread of yellow fever.

It is clearly conceivable that dried leaves with eggs attached might, by wind alone, be spread over immense distances, while by export of raw materials in bales of all sorts, dried leaves with the eggs adhering could very well be distributed to the ends of the earth. Moreover, the hardiness of *S. fasciata* would permit of its establishing itself in many places where it is not found to-day, and with the vector of yellow fever present, the living virus—if such it prove to be—need only be introduced into the infested area, for the danger of an epidemic to be made manifest.

Short List of Literature which deals with Mosquito Life-histories.

Berkeley, W. N. (1902). "Laboratory work with Mosquitoes."

Giles, G. M. (1902). "Gnats or Mosquitoes, including a Revision of the Anophelines."

Goeldi, E. A. (1905). "Os Mosquitoes no Para."

Howard, L. O. (1901). "Mosquitoes."

Howard, Dyer and Knab (1912). "The Mosquitoes of North and Central America and the West Indies."

James and Liston (1911). "The Anopheline Mosquitoes of India."

Mitchell, E. G. (1907). "Mosquito Life."

Patton and Cragg (1913). "A Text-book of Medical Entomology."

Ross, R. (1900). "Malaria and Mosquitoes."

Smith, J. B. (1904). "Report of New Jersey State Agricultural Experimental Station on Mosquitoes."

Theobald, G. V. (1907). "A Monograph of the Culicidæ or Mosquitoes."

[1] "Parasitology," vol. iv, 1911.

NOTE ON THE OCCURRENCE OF *LANKESTERIA CULICIS* IN WEST AFRICA.

By A. C. Stevenson

and

C. M. Wenyon.

Wellcome Bureau of Scientific Research.

During the course of some very interesting mosquito-breeding experiments which Mr. MacGregor has been conducting and which are described in his paper, which will be found in another part of this number, we noted that some of the mosquitoes (*Stegomyia fasciata*) harboured gregarines. One of us had worked with the gregarine of *S. fasciata* in Bagdad and had given an account of its development.[1] The gregarine of the Bagdad *S. fasciata* had been found to belong to the genus Lankesteria, so that its name became *Lankesteria culicis* Ross 1898. It had first been noted by Ross in India in these mosquitoes in 1898, and later by Marchoux, Salimbeni, and Simond in South America. It is this same gregarine which has turned up in Mr. MacGregor's mosquitoes, which have been hatched in this country from dried eggs. The interest of the observation is twofold. In the first place, *L. culicis* which has been recorded from India, South America, and Bagdad, is now known to occur in West Africa, from whence the Stegomyia eggs came. In the second place, the gregarine sporocysts must have been submitted to the same amount of drying as the mosquito eggs and the mosquito larvæ hatching from the eggs became infected by ingesting these sporocysts. Furthermore, the gregarine infection has passed through several generations of mosquito in this country, so it is easy to understand how such an infection could spread from one end of the world to the other.

Twenty-eight Cases of Pyorrhœa treated with Emetin Hydrochloride (A. H. Allen, *Naval Medical Bulletin*, July).—A hypodermic injection of emetin hydrochloride, ½ gr., was given daily in the arm for six days. Active antiseptics were used locally; these included various antiseptic alkaline mouthwashes and the local application of trichloride acetic acid or tincture of iodine to the pus pockets. At the end of six days smears were examined, and if amœbæ were still present three more hypodermic injections of emetin were given. Nine injections has been the greatest number that have been given. In three cases in women, owing to the soreness of the arm resulting from the daily use of the hypodermic syringe, the injections were alternated with the administration of two ipecac. tablets three times daily. This work, started in January, 1915, covered a period of five months. The use of emetin in conjunction with local measures has been beneficial in 77 per cent. of the cases, although an actual cure was obtained in only 35 per cent.

[1] Wenyon, "Parasitology," vol. iv, 1911.

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SEPTEMBER 1, 1915.

DAMP HEAT AND ITS EFFECTS.

An interesting paper by Surgeon D. A. Mitchell, R.N., appears in the *Journal of State Medicine* for September, 1915, on "Some Effects of Damp Heat." The observations are chiefly made in the environment of the Persian Gulf, and they would seem to indicate that there is "something in the belief" that climate does play a large part in disease and that bodily changes are brought about by climate *per se*, changes due to physiological effect independently of pathological infections. It has been said that all physiological deficiencies open the door to pathological infections, and that without the latter the former would never cause illness, or produce what is known as "an unhealthy climate." The tendency at the present time is tc despise mere climatic conditions as producers of disease and to hold to the theory—no germs no disease. A perusal of Surgeon Mitchell's paper scarcely bears this out, for he shows the direct deleterious effects of a damp, hot climate to be capable of bringing about a marked increase in anæmia and invaliding. We have had many papers on this subject by Dr. Matthew O'Connell in which the author proves that pyrexia and anæmia are brought about by exposure to the moist, hot atmosphere met with in Lancashire weaving sheds and mills. Surgeon Mitchell particularly draws attention to the presence of boils, under which he includes mere pustules, ordinary boils, and carbuncles. These skin affections were not, apparently, due to an erroneous dietary, constipation, or faulty metabolism, but in the absence of any ob.ious infective cause it would seem that the condition was primarily due to some alteration in the blood dependent upon the damp heat obtaining in certain parts of the Persian Gulf.

The examination of the blood proved negative so far as any organism was discoverable, but one condition seemed always present, namely, anæmia. It is easy to say that the anæmic state favoured the inroad of pathological germs, and that the illness was due to the action of those germs, but a standpoint may be taken on the physiological aberration alone and before the deteriorated tissues are attacked by germs, and it is this feature of the effects of climate that Surgeon Mitchell and Dr. Matthew O'Connell have brought home to us. There is a condition brought about by a moist, hot climate which is characterized by two phenomena, anæmia and a febrile state. The febrile state is due to physiological changes, quite apart from parasitic infection; we find it in the Lancashire sheds and in every part of the world where a hot, moist temperature prevails. The febrile state, the low fevers, the not-yet-diagnosed ailments which figure so largely on charts and cards at the bed-heads of patients in warm climates, may be laid at the door of climate quite fearlessly where a moist atmosphere prevails. The attempt to stifle the deleterious effects of climate by epidemiologists and others is not a creditable position to take up. That the term "an unhealthy climate" is synonymous with malarial infection is all very well for a popular cry; there is, no doubt, much truth in it, and the announcement of the legend for public consumption does good in almost every way; but for men to accept it as a scientific truth is quite another thing. It may be said: "But what is the good? You cannot alter the climate of a district, so why dwell upon the subject?" We cannot alter the moist, relaxing climate of the south-west of England or Ireland, nor of the valleys of mountainous districts; nor can we change the bleaching effect of these and other places where the south-west wind, bearing heat

and moisture, is the prevailing wind. Let this be recognized, whether in the Tropics or elsewhere, is all that is claimed by Dr. Matthew O'Connell, Surgeon Mitchell, and others.

When this great clinico-physiological fact is recognized and acted upon, then we shall be taking a step forward in the rational treatment of disease, not groping in darkness with drugs and hunting for parasites in a condition that has, in all probability, nothing to do with infection by parasites or bacteria of any sort. If this state is recognized, and it must be admitted it cannot hastily be diagnosed, it is evident, when it becomes marked, that there is only one thing to do, that is, to seek change elsewhere, to go where the climate is dry, even if it is hot; or, better still, to regions where the air is bracing, as in high ground in Europe away from the seaside, to the Yorkshire moors, Scottish hills, or the Alps, especially in the months of January and February.

Without dogmatizing, it is often well to make a statement if for nothing else than to base an argument upon when it is desired to advance knowledge. It may be stated (1) that a great many of the febrile states met with in tropical climates are due to climate alone; (2) that so-called "low fever" is almost invariably the effect of a hot, moist atmosphere, in other words, it is due to climate.

In reference to "boils" as occurring frequently in the hot, moist regions of the Persian Gulf, Surgeon Mitchell compares with the prevalence met with in such dry climates as, for example, at Basrah and in a climate intermediate between the excessive moisture of the Gulf and the dryness of Basrah, as that met with in Bombay, and finds that boils appear and disappear in proportion to the moisture and dryness of the atmosphere. This may be interpreted by the possibility of the microbic infectivity being increased in moist and lessened or altogether absent in dry heat; but the writer seems to incline to the belief that the outbreak may be due primarily to other causes than those of a microbic nature, an opinion which will meet with but scant support at the present day, but may, nevertheless, be quite true.

"Many of the boils were deeply situated, giving rise to much swelling, redness, and diffuse infiltration; but, as a rule, there was hardly any constitutional disturbance. If incisions were made into these swellings it was found that they refused to heal, and as often as not the pus would choose its own track and ignore these artificial paths." The inference would seem to be that the origin of the trouble was due to a necrosis, possibly of embolic origin. The boils referred to do not include such specific infections as Oriental sore, &c., but a condition of things for which no specific microbic cause was discoverable. Surgeon Mitchell's contribution to the subject of climate and its effects is a valuable one and opens up a wide field for study and thought.

Annotations.

Prophylaxis of Cholera (E. Gildemeister and K. Baerthlein, *Münch. med. Wochenschrift*, No. 21).—Gildemeister reports the results of bacteriologic examination of stools from seventy cholera patients. The cholera germs were not found for more than one to five days in a third of the stools, but in sixteen they were living for three weeks, and in one stool each for from thirty-one to thirty-seven days, and in one case for fifty-one days. The germs survived equally long in stools from healthy carriers. Mixed infection with dysentery and cholera has been frequently encountered in the eastern arena of war.

Problems in Regard to Pathology and Treatment of Dermatomycoses (Bloch, *Munch. med. Wochenschrift*, No. 22).—Certain infectious diseases of the skin confer allergy on the patient, so that he reacts in a specific manner to an extract made, like tuberculin, from the trichophyton fungus, the favus fungus, &c. The trichophytin, favin or sporotrichin induces a specific allergic reaction like the von Pirquet reaction in tuberculosis. The local focus is merely the anatomic expression of the localization of the allergy at the point of infection. According to these views every infectious disease of the skin is at the same time a general process, affecting to a greater or less extent the organism as a whole. These views justify treatment with the extract of the fungus in question, and Bloch here reports favourable experiences with subcutaneous or intradermal injections of trichophytin or the killed fungi themselves.

Prophylaxis and Treatment of Venereal Disease in an Army on Active Service (P. Sabella, *Il Policlinico*, June 13).—Sabella cites the various writers on this subject in the last few months, their number and prominence attesting the importance of the subject from the standpoint of military efficiency. In the recent Italian campaign in Tripoli no prostitutes from Europe were allowed to enter the country, and the native prostitutes were kept under medical supervision twice a week. Those found diseased were sent to a special department of the civil hospital, where they were interned and treated until danger of contagion was past. With this system of "hygienic brothels" and enlightenment of all the troops, the incidence of venereal disease was kept at a low figure, both in the camps and the barracks, and this notwithstanding that syphilis is widespread among the native population and that its manifestations are grave and highly contagious in hot countries. Preventive measures have amply proved their usefulness in the navy. On return from shore leave each man is interrogated, and, when there has been a chance for contagion, preventive measures are applied at once, washing with a 0·5 per thousand solution of mercuric chloride, injecting into the urethra a few cubic centimetres of

a 2 or 3 per cent. solution of some silver salt, as nitrate, and smearing with a 30 per cent. calomel salve. Similar or even stricter measures should be enforced for the land troops, he declares. A preventive packet for the men would prove as useful as the first-aid packet for dressing wounds now supplied to every man in the service.

Wassermann Reaction in Malaria, Kala-azar, and Leprosy (Sutherland and Mitra, *Indian Journal of Medical Research*, No. 4, 1915).—The blood of fifty patients in which malarial parasites were present was tested for a Wassermann reaction. Nine cases gave a positive reaction; at least three were probably syphilitic. Of the blood of thirty-eight cases of kala-azar, the parasite had been found, by careful and competent observers, in smears taken from splenic material obtained by puncture; ten gave a positive and twenty-eight a negative reaction. Of the ten positive cases, only two gave a more than slightly positive reaction. They examined the serum of thirty-four patients of undoubted leprosy. Fourteen were of the anæsthetic form; of these, four gave a positive and ten a negative Wassermann. Of the remaining twenty patients, seven gave a positive and thirteen a negative Wassermann.

Abstracts.

TYPHOID FEVER WITH SUPPURATING OVARIAN CYST.[1]

By Lieutenant H. G. C. Mold.

The patient, a female, aged 22, unmarried, was admitted to hospital on May 12, 1915, with a preliminary diagnosis of typhoid fever.

She had not had any illness up to four months ago, when she had a cough and was "feverish"; since then she has had amenorrhœa. In January, 1915, she was inoculated once against typhoid fever. Shortly afterwards she was wounded in the left shoulder by shrapnel, but the wound healed quickly.

The present illness began four weeks ago with diarrhœa and abdominal pain. She was feverish and was bleeding from the nose, but had no headache. When she was admitted she was well nourished, but looked flushed and feverish, her temperature was 100·8° F., and her pulse 120 per minute. Her tongue was coated with a thick white fur, but was moist. The abdomen looked full and was very tender and rigid, especially so in the right iliac fossa. On palpation a large, firm, smooth, swelling was felt, extending from above the symphysis pubis to the umbilicus; it was almost central, but was inclined slightly to the right. The swelling was dull upon percussion and there was no fluctuation. A catheter was passed, but only 2 oz. of highly coloured urine were withdrawn, and the swelling persisted.

Upon examination *per vaginam* the cervix was found to be pushed far over to the left side, and the uterus was behind the tumour and to the left of it. The tumour appeared to be distinctly to the right of the middle line, and was very tense. There were no breast changes, and the other organs appeared to be normal. A blood culture was taken, which proved to be negative.

The patient's condition remained much the same, with fever and a rapid pulse, until May 16, when she seemed to get worse; the temperature rose to 102·2° F., and she started vomiting. It was decided to operate, and on May 17 a laparotomy was performed under ether given by the open method. A large unilocular ovarian cyst was found; this originated from the left ovary, and its pedicle formed a continuation of the left broad ligament. There were some adhesions to the pelvic wall. The cyst was removed, leaving the ovary behind.

The cyst contained about two pints of a grumous semi-purulent fluid, from which the *Bacillus typhosus* was obtained in pure culture.

At 7 p.m. the patient was very feeble, her pulse was 140, and the temperature 100·8° F. A pint of saline solution was given *per rectum*, and a hypodermic injection of digitalin $\frac{1}{100}$ gr. and strychnine $\frac{1}{60}$ gr. was given every four hours. She had a fair night without much pain, and on May 18 was better, her temperature being 98·6° F. and her pulse 120 per minute. There was no vomiting. A slight hæmorrhagic vaginal discharge was noticed, and persisted for two days.

She made a rapid and uneventful recovery.

A CASE OF TETRAGENUS SEPTICÆMIA.[1]

By Lieutenant Henry Robinson.

A soldier of three years' service and aged 23 was admitted to hospital on March 18, 1915, complaining of pain in the feet of about six days' duration, with steadily increasing malaise, weakness, and anorexia. He had also a slight headache and a very slight cough. There had been some abdominal pain at the commencement of the illness, but this passed off before the man came under observation; on admission he was constipated, as is not unusual in men who have been a long journey on an ambulance train. He had not vomited. There had been no nose-bleeding nor sore throat.

The only account of previous illness was a fever of some kind in India about a year before. He had never had rheumatism. He had been three times inoculated against enteric fever, the last time nearly a year previously.

On admission he looked fairly comfortable; not flushed, no herpes. He was rather deaf, and in view of a subsequent occurrence it is regrettable that no inspection of the ears was made. The tongue was red at the edges, furred in the centre. Temperature, 103° F. The pulse-rate was 120 on admission, but dropped soon afterwards to under

From *Journal of the Royal Army Medical Corps*, No. 5, 1915.

[1] From *Journal of the Royal Army Medical Corps*, No. 5, 1915.

100; regular, low tension, skin moist, no rheumatic smell.

On examination nothing abnormal was found in the lungs. The heart's apex was just internal to the nipple in the fifth interspace. A soft blowing apical murmur was present, heard also at the basal region. There was no abdominal distension, gurgling, tenderness, or rigidity; and no spots. The spleen was doubtfully palpable. There was no swelling or redness of the feet, though they were tender when handled. A diagnosis of acute rheumatism was made, and 20-gr. doses of salicylate of soda with equal amounts of bicarbonate were given four-hourly, together with a brisk purge. On the off-chance of the case being one of enteric fever, blood was withdrawn from a vein for cultivation; it was sterile. Under treatment the temperature fell rapidly, and became absolutely normal after six days. On March 22 the man was much better in every way, and it is noted that the apical first sound was then almost normal, but still slightly impure. On the 26th the murmur was once more in evidence, though in other ways the patient had improved. On the following day salicylate treatment was discontinued altogether; the dosage had already been cut down as the symptoms ameliorated. The diet was cautiously advanced and absolute recumbency was maintained. On March 31 there was a slight nocturnal rise of temperature, and next morning a sudden return of pain in the legs and malaise occurred, together with a temperature of over 103° F. Soon afterwards a condition of apathy almost verging on coma set in. There was no swelling or redness of the joints. Large doses of salicylates were once more exhibited, but this time without the slightest effect. The cardiac murmur was still present. On April 3 the man complained of pains in the ankles, shoulders, and spine; nothing abnormal was detected on examination of those regions. The temperature was 104° F., the pulse-rate 128, and the cardiac murmur had entirely disappeared. No petechiæ or abscesses were present. A diagnosis of infective endocarditis was arrived at, a further sample of blood was taken for culture, and the salicylate was discontinued.

On April 4 the man was slightly cyanosed; he complained chiefly of pain over the pericardium and base of the left lung. A double mitral murmur was heard at the apex, which was tender. A cough began on this day, and patches of broncho-pneumonia were found in both lungs. The spleen was enlarged. Pulse 120, very weak and dicrotic. Temperature 105° F.; patient very delirious. Quinine sulphate in heroic doses was ordered.

Next day there was a distinct improvement. The cardiac murmurs were unchanged, but the temperature was lower, the pulse less weak and dicrotic; the cyanosis had disappeared. On April 6 the improvement continued, though there was still some nocturnal delirium. On April 7 it is noted that he felt better, though the pulse tension was still very low; there was copious muco-purulent expectoration. The blood contained the *Micrococcus tetragenus*. By the 10th the temperature was normal, and the præcordial pain was much less; there was some blood mixed with the muco-purulent expectoration. On April 14 a general quinine rash was observed, and also a purulent discharge from the right middle ear; but the general condition was much improved, and the cardiac murmurs were no longer heard. On the 16th pleuritic pain was present on the left side, and examination showed a small patch of consolidation, with crepitations and bloodstained sputum, and a temperature of 100° F. Quinine was once more freely pushed. This attack soon subsided, though the sputum was still stained six days later, when the patient was feeling much better and asking for food.

About this time the heart sounds were normal, cough practically gone, and, apart from weakness, hardly any morbid signs except aural discharge. From this discharge a coccus was cultivated, which grew both in pairs and in fours; it was regarded as the same organism (tetragenus) as that which had already been recovered from the blood. On April 27 the patient developed slight femoral thrombosis on the left side. On May 5 it is noted that the ear had ceased to discharge, and the heart sounds were normal; but there was still tenderness, and a hard cord was still palpable along the line of the femoral vein. A few days later the patient was transferred convalescent to a hospital ship.

The exact sequence of events in the pathology of this case is not absolutely certain. The original attack seemed to respond satisfactorily, though not immediately, to salicylate treatment. It may have been true acute rheumatism; alternatively it is arguable that it was really even then a tetragenus infection. When the first relapse took place the diagnosis of infective endocarditis supervening on a simpler rheumatic lesion seemed inevitable, and a bad prognosis was formed. The temperature chart alone would suggest a pneumonia, but it was only after two or three days of high pyrexia that cough and pulmonary signs developed. The middle-ear abscess may have been pyæmic in nature; it would have been of great advantage in deciding this point if the ears had been examined for old perforations on the patient's first admission.

A FOLDING DHOOLIE.[1]

By Major D. S. Skelton.

As regards the carriage of wounded in East Africa, the ordinary pattern of open stretcher is not suitable for carrying white men any distance. The operations on the coast were being carried out under a blazing tropical sun, whilst any form of wheeled-covered transport was in general impracticable. The ordinary Indian dhoolie is heavy and cumbrous.

The accompanying photographs show the folding dhoolie devised for the Zanzibar Field Ambulance.

[1] Abstracted from *The Journal of the Royal Army Medical Corps*, No. 5, 1915.

Fig. 1 shows it closed, together with the method of carriage; and fig. 2 shows the way the Swahili stretcher-bearer carries it when loaded. It may be mentioned that in fig. 2 a strap should be shown

The stretchers were made in Zanzibar by local carpenters, and the iron work was executed in the Bazaar; the weight amounted to about 6 lb. This pattern of dhoolie was approved by the Indian Field

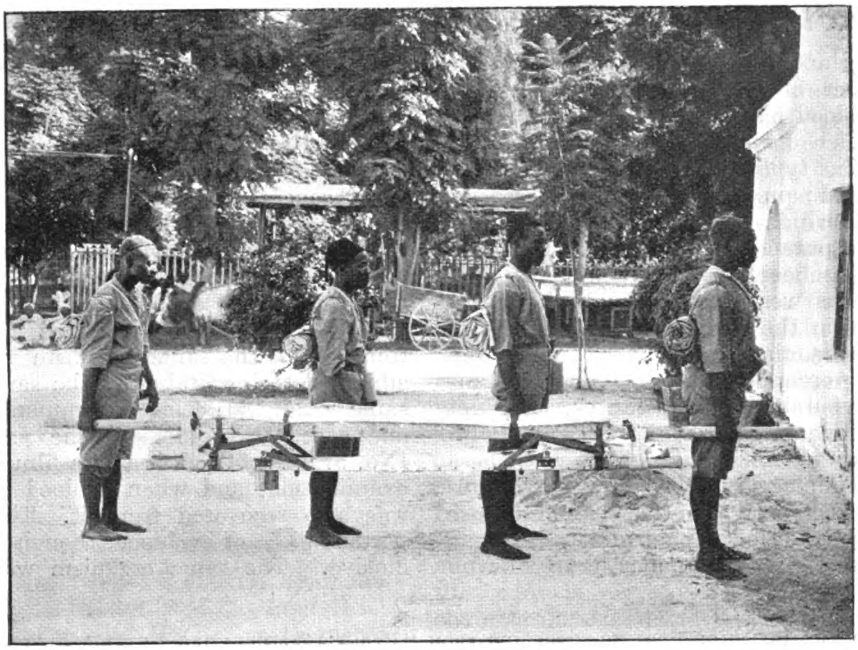

FIG. 1.

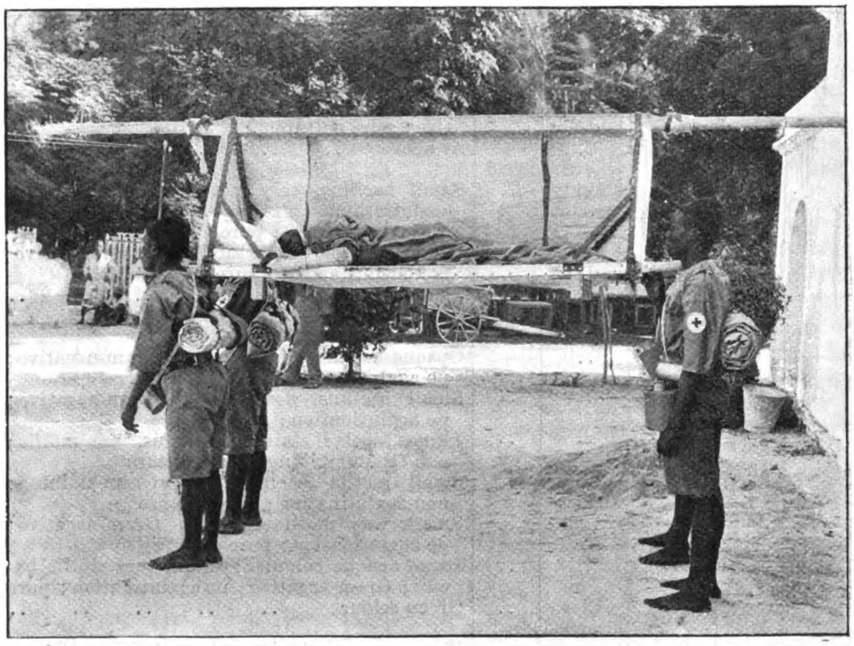

FIG. 2.

which could be fastened round the chest of the wounded to prevent him falling out. Carried on the shoulder, as is shown in the photograph, the stretcher-bearers can march all day.

Ambulances accompanying the Expeditionary Force to East Africa, who requisitioned for some to be made and furnished to them, after the Officer Commanding had seen them working in the field.

NOTES ON ORGANISMS ISOLATED FROM THE BLOOD OF CASES SUFFERING FROM SYMPTOMS SIMULATING MILD ENTERIC FEVER OR PARATYPHOID FEVER.[1]

By Major C. F. Wanhill.

During three years' laboratory work in Mhow a very large number of blood cultures have been examined, since blood has to be taken in all cases, not malarial, which have continued pyrexia. In many cases *Bacillus typhosus* or *B. paratyphosus* A have been isolated; in some several organisms grew on the plates which were obviously contaminations; but in some pure cultures of organisms which had not previously been associated with disease-producing organisms were recovered.

Among workers in the Tropics there has been a conviction for years that besides the recognized disease-producing organisms there are organisms which, given favourable circumstances, can get access to the blood and cause a septicæmia with symptoms similar to mild enteric fever. These diseases have been placed in the "pyrexia of uncertain origin" class, and it is to this class of disease that most attention has been paid of late years, a class becoming smaller and smaller yearly owing to improved methods of diagnosis and to bacteriological research. There are, however, a very large number of cases which can be attributed to no definite disease, and it may be, as the following results of blood examinations seem to show, that organisms, ordinarily non-pathogenic, can under favourable circumstances become pathogenic.

Only the cases in which organisms were recovered in pure culture from the blood are given, and it is thought that such organisms may be reasonably supposed to have actually come from the blood and not to be contaminations, as these would probably show several organisms and not one only. The results are indefinite, and can only be proved by weight of evidence. The organisms vary also greatly in their reactions, are all non-pathogenic to guinea-pigs, and do not admit of any classification. In some cases it will be noticed that two cases, from which the same organism was isolated, were admitted to hospital from the same unit about the same time, indicating a common infection, and in one case, Driver S——, the particular organism (No. 9) was noticed first in a film made for malarial examination, and when a blood culture was made was also recovered from it. This seems an important piece of evidence, though of course not conclusive. The same organism was recovered from

Organisms isolated from the Blood of Persons suffering from "Pyrexia" simulating Enteric Fever or Paratyphoid Fever.

No.	Glucose	Lactose	Mannite	Cane sugar	Dulcite	Peptone water	Litmus milk	Inulin	Characteristics	Name and Date
1	+	+	+	+	−	..	..	+	Motile; Gram-negative; agglutinations; *B. typhosus* and *B. paratyphosus* A negative; pure culture	Mrs. W——, 18.9.12. Agglutination with her own serum up to 1 : 200.
2	+	+	+	+	−	..	Acid and clot	−	Motile; Gram-negative; agglutinations negative; pure culture	Pte. C—, 28.9.12.
3	+	+	+	−	−	..	..	± Acid	As above	Pte. D——, 23.9.12; Lce.-Cpl. H——, 29.5.14.
4	+	−	+	+	−	Indol	Acid no clot	..	Small bacillus, very motile; Gram-negative; agglutinations; *B. typhosus* 1 : 100, *B. paratyphosus* A 1 : 200; pure	Pte. W——, 7.4.14.
5	+	−	+	+	−	,,	Acid and clot	..	Very small, non-motile bacillus; Gram-negative; non-agglutinating; pure culture	Gr. G——, 10.3.14.
6	+	−	+	+	−	−	−	..	As above	Gr. E——, 12.11.12; Gr. T——, 12.11.12 (Y Battery R.H.A).
7	+	−	+	+	−	..	..	+	Opaque colonies, non-motile; Gram-negative; no agglutination; pure culture	Pte. C——, 20.9.12; Gr. T——, 20.1.13.
8	+	−	+	−	+	..	−	−	Small bacillus, non-motile; Gram-negative; no agglutination; pure culture	Pte. C——, 25.9.12.
9	+	−	+	−	−	−	−	−	Large bipolar staining bacillus, non-motile; non-Gram-staining; pure culture	Dvr. S——, 12.10.12; Bomb. R——, 24.9.12.
10	Acid	−	+	+	−	−	Acid and clot	..	Small motile bacillus; non-Gram-staining; non-agglutinating; pure culture	Lce.-Cpl. B——, 30.4.13.
11	,,	−	Acid	−	Acid	−	Acid	..	Small, very motile bacillus; Gram-negative; no agglutination; pure culture	Pte. G——.
12	,,	−	,,	Acid	−	..	,,	..	Large opaque colonies; small, very motile bacilli; Gram-negative; no agglutination; pure	Dvr. S——, 22.11.12.
13	,,	−	,,	−	−	..	Clot bleached	..	Green colour	Five cases.
14	−	Acid	−	−	−	..	..	−	Firm, opaque colonies, not emulsifying; Gram-negative; agglutination negative ± motile	Pte. R——, 21.9.14.
15	Acid	−	−	−	−	−	Alkaline	..	.. ..	..
16	−	−	−	−	−	..	−	−	Small bacillus ± motility; non-Gram-staining or agglutinating; pure culture	..

[1] From *Journal of the Royal Army Medical Corps*, No. 5, 1915.

Bombardier R——'s blood, from the spleen of Corporal R——, who died of symptoms of food poisoning, and from the stools of Mrs. H——, who died with choleraic symptoms, all about the same time. This certainly seems to point to this being the causative organism.

The publication of these results may have the effect of bringing out the experiences of other bacteriologists in this line, and in this way some definite results may be obtained.

Notes and News.

PAPER AS CLOTHING.

In Japan "Kamiko," as it is called, is paper made from mulberry bark. Between two thin layers of the paper a thin layer of silk wadding is placed, and the whole is quilted. The chief drawback to the material is that it cannot be washed. The Japanese are making paper shirts for the Russian Army, which appear quite serviceable.

STERILIZATION OF WATER.

The ultra-violet rays from an electric light submerged in the liquid to be sterilized has lately been brought into practical use by M. Bellon Daguerre. It is stated that all disease-spreading germs are completely eliminated by this process. As the apparatus can be mounted on a motor-car the process is available for armies in the field.

ANTHRAX AND SHAVING BRUSHES.

At an inquest on a lawyer's clerk, aged 38, it was stated that he had a pimple on the neck after shaving, and the following day his neck swelled so badly that he went to the West London Hospital, where he died. An examination of the blood was made and anthrax bacilli were discovered. There was no evidence that he had been in contact with any animal. A London County Council veterinary surgeon said that there had been no case of anthrax north of the Thames since last August. The disease was generally conveyed by personal contact with animals. It might have been conveyed by means of a shaving brush, for the hair of various animals was used in the manufacture of shaving brushes. He could not account for the infection in any other way. The moral seems to be that when one buys a shaving brush one ought to disinfect it before use.

THE VACUUM PROCESS OF PRESERVING MEATS.

A method of preserving and cooking corned beef, potted beef, brawn, hams, sausages, galantine, and any and every form of preserved meats recently brought forward, is likely to play a very important part in supply of food for tropical countries. Fresh beef and mutton of good quality is wellnigh impossible to obtain in any part of the Tropics owing to the inferior quality of available animals in hot countries, and in many parts "bully beef" only is obtainable. The consequence is the health of Europeans is affected and intestinal troubles are a common result of the deficiency.

Mr. L. M. Douglas describes in the latest number of the *Meat Trades' Journal* the steps adopted in the vacuum process for hams:—

Each ham is boned out, and placed in a pear-shaped tin, of a size suitable to the size and weight of the ham. The original shape is maintained, and when the boning out process has been completed some flavouring substances are lightly sprinkled over the cut surfaces of the meat, which is then pressed together, and placed in the pear-shaped tin, which it should fill tightly. The top of the tin is securely soldered on, and a small aperture, beside which a blob of solder has been placed, is left towards the narrow end of the cover of the tin. The tin is now ready for treatment. It is placed in a vacuum apparatus consisting of a circular chamber, in which is a rotating platform actuated from the outside. This chamber will hold some twenty ham tins, and it is charged through a door in the side. When the chamber is fully charged this door is closed tightly, and the air of the chamber is exhausted by means of an oil-sealed pump. Obviously, in exhausting the air of the chamber, the air will also be exhausted through the apertures on the lids of the tins. Hence the contents of the tins will, for the time being, be in a vacuum. In this condition the aperture of each tin is soldered over by means of an electric soldering bolt, which can be moved from the outside of the chamber in the vacuum, within a sufficiently large field to enable a certain amount of freedom of action inside the chamber. The operations inside the chamber are seen through a small observation window, and an electric light enables the soldering bolt to be accurately handled. Soldering having been accomplished in one tin is successfully carried out on the others, the moving platform in the circular vacuum chamber being actuated from the outside, so as to bring each tin under the field of the soldering bolt. As soon as the apertures have been soldered, a valve is opened, and air is allowed to enter the circular vacuum chamber, and it will be observed that the tops and bottoms of the tins immediately yield to the atmospheric pressure, being pressed inwards. Any tins which do not yield in this manner are faulty and have been badly soldered. The defect should be remedied, the aperture in the cover re-punctured, and the tins should be treated again. The tins can now be removed from the vacuum chamber, and are ready for the next operation.

The tins are now placed in a cage belonging to a vertical autoclave, and closely packed together. The number of autoclaves used would be in direct proportion to the business to be done. The cage of the autoclave is carried by means of tackle sus-

pended from an overhead rail. It is raised sufficiently high to clear the top of the autoclave, and is then lowered into it, the tins being submerged in a bath of hot water. The autoclave has a steam jacket, which maintains the temperature of the water inside, but when the cage has been lowered the cover of the autoclave is screwed down, and by means of steam pressure the temperature inside is elevated to 240° F., at which degree it is maintained until the hams are cooked, the length of time required varying slightly, according to weight. A large ham will take about four hours to cook, smaller ones being in proportion; the average time required being 3¾ hours. This operation of cooking the fresh hams in the tins prevents any loss of weight, and also maintains all the flavour of the meat; the advantages over the old-fashioned way are apparent. The advantage of cooking the tins *in water* inside the autoclaves lies in the equalization of the pressure which results. In so far as the keeping properties are concerned, it may be safely stated that the hams are never likely to deteriorate, or alter in any way within the limits of several years after being tinned in the manner indicated.

Army rations, such as sliced bacon, bacon and vegetables, or meat with vegetables, can be expeditiously and effectively canned by this method, which may be described as being applicable to the preservation of every kind of perishable food in tins.

Correspondence.

LOW FEVER.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—I was much interested by your article on "Low Fever" in a recent number. This is a subject to which I have given a considerable amount of attention in the last few years, largely because a member of my own family has suffered a good deal from the disease. Probably the term includes more than one disease, and the presence of a persistent small rise of temperature should make us examine the patient with all the care which we can command so that no cause may be overlooked. For instance, the other day I heard of a case in a child who had a temperature rising to about 100° F. every day for some months, which was thought to be "low fever" until something drew his attendant's attention to the heart, when a murmur was found, and it then appeared likely that the disease was a low form of septic endocarditis (there had been a small septic wound which had been forgotten).

Then, again, doubtless some cases are malarial, but when all due allowance is made for these various cases, there remain a number for which no cause can yet be assigned.

The best clinical description I know of the disease is that given by Rogers in his book on "Fevers in the Tropics," where he describes it as "low continued fever of European immigrants." The picture he gives is most accurate, and when I read it to the member of my family previously mentioned, she exclaimed: "Why, that is exactly how I feel!"

In my experience the disease is almost entirely confined to European women, but that may be accounted for by the fact that it is not a crippling disease, and consequently men do not consult the doctor for the trouble. As regards natives, I cannot say whether it occurs amongst the women, as they do not commonly consult us, but I do not remember to have seen a case in an Indian male.

The disease is characterized by a daily rise of temperature to 99·5°, 100°, rarely 101° F., occurring about midday and returning to normal in the evening. There is a feeling of lassitude and some aching of the limbs and immense depression—much more depression than can be accounted for by the physical conditions. The pulse is somewhat quickened, but not more than corresponds to the temperature. The complexion becomes sallow, and the appetite is capricious, with the result that the patient loses weight, but there is nothing that can be called emaciation.

I have made numerous examinations of the blood in several cases, and have never succeeded in finding any parasite, either protozoal, by microscopic examination, or bacterial, by blood culture. The only feature of the blood which I have found to be constant—or nearly constant—is an increase in the proportion of eosinophile cells, the count usually showing about 6 or 7 per cent., though I have seen one case giving a percentage as high as 15 per cent. This naturally led me to look for intestinal parasites, but with negative results.

For a long time I found no drug that seemed to have any influence on the disease, and the only thing to do was to send the patient to the hills or to the seaside, failing which there was nothing for it but to wait for the cold weather, when it automatically came to an end, to recur, however, with the return of the hot season. Latterly, however, I have had encouraging results from the use of hypodermic injections of "orsudan." And a friend of mine informs me that he cured one case by a single intra-muscular injection of salvarsan.

The etiology of the disease is obscure. I was inclined to think that there was some fault in the heat-regulating centres, as the disease usually came to an end with the advent of cool weather; but the action of the arsenical compounds, as mentioned above, if confirmed by further experience, points to some protozoal infection which has not yet been discovered.

I shall be glad of any suggestions as to lines which investigation might take—I am almost certain to see cases before long, and though the patients are not in hospital I might be able to follow out any line of inquiry which promised well.

I am, Sir, yours, &c.,

W. A. MURRAY, M.B., D.T.M. & H.

Chittagong, E. Bengal,
August 31, 1915.

Original Communication.

NILE BOILS IN THE ANGLO-EGYPTIAN SUDAN.

By Albert J. Chalmers, M.D., F.R.C.S., D.P.H.
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and

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Introductory.

In the April 1 Number of this Journal for 1915 there appeared a paper by Captain A. P. O'Connor, R.A.M.C., and one of us recording a small epidemic of Pyosis Corletti among British soldiers, which was found to be due to a coccus called *Aurococcus mollis* (Dyar 1895). The epidemic appeared to originate from an officer who was at the time suffering from Nile boils, which are nothing more than a variety of tropical boils or tropical furunculosis, as described in Castellani and Chalmers's "Manual of Tropical Medicine," and found in Egypt and the Anglo-Egyptian Sudan, where they are locally known as *Habba*, if numerous, and *Dimmel* if there is only a single example. With regard to their causation, Madden says that Professor Symmers obtained from Egyptian Nile boils a pure culture of *Staphylococcus pyogenes aureus*, which, translated into modern nomenclature, might mean *Aurococcus aureus*, but might not, as the name *Staphylococcus pyogenes aureus* covers more than one variety of organism. The fact that Nile boils might be due to some organism differing from *Aurococcus aureus* was rendered probable by Archibald's observation that an autogenous vaccine was much the best treatment.

For these reasons it became interesting to investigate the nature of the organism or organisms causing Nile boils and to compare it or them with *Aurococcus mollis* (Dyar 1895), as described in Khartoum by Chalmers and O'Connor.

We, therefore, have studied in detail the organisms which we have isolated from three cases of Nile boils. One of these cases occurred in Port Sudan, and thanks to the kindness of Dr. Footner we were able to have inoculated media sent by post to Khartoum, while the others occurred in Khartoum.

Etiology.

The organisms in all cases were obtained in pure culture in the media primarily inoculated from the boils. In all cases they gave the same reactions, which are as follows:—

Morphological Characters.—The organism present in preparations made from the boils and from the cultures is a non-motile circular coccus, usually measuring about 1 micron in transverse diameter (0·7 to 1 micron), and is often observed to be grouped in staphylococcal masses. No streptococcal forms could be found either in the original lesions or in the cultures. It colours readily with the usual laboratory stains and is Gram-positive, but not acid-fast as tested by the Ziehl-Neelsen method.

Biological Characters.—It grows well aerobically on the usual liquid and solid laboratory media at 22°, 37°, and 40° C., but not at 60° C. Growth at 20° C. was practically as good as that at 37° C., and the pigment production on the surface was also as good as at 37° C. It is also a facultative anaerobe. The anaerobic growth is not appreciably different from the aerobic in quantity, but is white in colour.

Cultural Characters.—Its typical growth is that obtained aerobically upon *agar-agar*, when it appears in the original culture as small white colonies in twenty-four hours. These growths, after forty-eight hours, attain the size of about 2 mm. in diameter and are raised from the surface of the medium and acquire an orange-buff colour, similar to that depicted by Ridgway in his Colour Standards on Plate III, *d*, 15 Y-O. In subcultures on agar slants it appears as a continuous orange-buff-coloured growth. In agar stabs it forms a nail-like growth, spreading out on the surface into an orange-coloured head, while the shaft of the nail in the medium is white.

On *blood serum* it produces the typical orange-coloured growth.

It formed a fair amount of growth on *gelatine* at 22° C., but in none of the cases was there any liquefaction.

In *broth* and *peptone water* it produced a general turbidity.

On *potato* it grew well, giving rise to the typical orange-coloured growth.

Biochemical Reactions.—It produced acid but no gas in the following sugar-peptone media after seven days' incubation at 37° C. All reactions were controlled by uninoculated tubes.

Monosaccharides.—Glucose, levulose, and galactose. Mannose could not be used as it was out of stock and not obtainable because of the War.

Dissaccharides.—Maltose, saccharose, and lactose. It produced neither acid nor gas in the following media under the same conditions as above:—

Monosaccharides.—Arabinose and xylose.

Trisaccharide.—Raffinose.

Polysaccharides.—Dextrine, inulin, starch, and glycogen. Sometimes, after long incubation, there was slight acidity in dextrine.

Glucosides.—Amygdalin, salicine, helicin, and phlorrhizin.

Alcohols:—

Tetrahydric.—Erythrite.
Pentahydric.—Adonite.
Hexahydric.—Dulcite, isodulcite, mannite, sorbite, and inosite.

In *litmus milk* slight acid was formed and there was also slight clotting.

In *neutral red peptone* it did not produce a green fluorescence. It did not produce *indol* nor did it give the *Voges-Proskauer* reaction, but it reduced *nitrates* to nitrites. It had a *hæmolytic action* upon rabbits' blood.

Relationship to the Boils.

We believe the organism just described to be the cause of the boils, because:—

(1) It was the only organism to be seen when the contents of a boil were aseptically collected and examined microscopically.

(2) It was obtained in perfectly pure cultures in the first inoculations of media from the boils, and it was obtained in media inoculated at places as far apart as Khartoum and Port Sudan and by different workers.

(3) A vaccine prepared from it very quickly cured the cases from which it was cultivated, even when the usual commercial mixed staphylococcal vaccine had failed.

(4) A vaccine prepared from the organism separated from one case quickly cured the boils in another case from which the same organism was cultivated when the usual commercial mixed staphylococcal vaccine had failed.

As we had been for some years in Khartoum it was considered useless to try to produce boils by inoculating ourselves with living cultures, as we had not been perfectly free from these nuisances, and even if we had developed a crop of boils it would have proved nothing, as they might have been caused by a natural and not an experimental infection.

Systemic Position.

The organism which we are considering, being in its free condition spherical and dividing in one plane without previous elongation, not being motile nor producing endospores, belongs to the Schizomycete family, *Coccaceæ* Zopf 1885 emendavit Migula 1900.

When one comes to the question of the generic and specific determinations of an unknown species of this family we are met with a bewildering mass of literature describing a very large number of forms. Thus, in 1905, according to the Winslows, no fewer than 445 *supposedly distinct species* had been described in the works of Cohn, Migula, Flügge, Chester, Sternberg, Lehmann and Neumann, Engler and Prantl, Rabenhorst, Frankland, Legros, and Woodhead.

But in that and the succeeding year Winslow and Rogers published a biometrical study of the reactions of 500 different strains of cocci following the methods already used in botany, and of which a beginning, as regards bacteria, had been made by Dyar in 1895. In 1906 Andrewes and Horder studied the streptococci in a similar manner to that followed by Winslow and Rogers for the other varieties of cocci.

Their combined work, followed by that of the two Winslows in 1908, resulted in a greatly simplified and probably much more natural arrangement of the known forms, especially as their genera seemed to mark stages in the evolution of the saprophytic into the parasitic species.

Since then Winslow, Broadhurst and Stowell, and Hilliard have continued the work by applying the same methods to the study of the streptococci, while other workers have done the same for certain groups of bacteria.

In 1913 Kligler, investigating the fifty-four strains of cocci, other than those belonging to Winslow's streptococcal and diplococcal groups, found in the collection of the New York American Museum of Natural History, proved the broad generic outline laid down by the Winslows to be valid and well established, but stated that further study on the same lines was required with regard to the species.

Our own work in this laboratory during the last two years has demonstrated the value of using Winslow and Rogers's generic determinations, but we agree with Kligler that the point at which Winslow and Rogers's classification fails is that insufficient details are supplied concerning the characters of the individual species.

We now propose to study the systemic position of the organism, the characters of which we have just described above.

Generic Determination.

Winslow and Rogers divided the family *Coccaceæ* into two sub-families, viz., the *Metacoccaceæ*, which is mainly composed of saprophytes, and the *Paracoccaceæ*, principally containing parasites. As the organism we have described above is a parasite which can grow under anaerobic conditions and does not produce very abundant surface growths and always divides so as to produce pairs, is Gram-positive, produces acid in glucose and lactose peptone media, it belongs to the sub-family *Paracoccaceæ* Winslow and Rogers 1905, of which the genera have been differentiated as follows:—

(A) *Saprophytes* in chains in zoöglœa masses. Pigment absent	*Ascococcus* Cohn 1875.
(B) *Parasites* in pairs, chains, or irregular groups, but not in zoöglœa masses.	
I. Pigment absent. Growth meagre	
(*a*) Inulin fermented. In encapsulated pairs	*Diplococcus* Weichselbaum 1886 emendavit Winslow and Rogers 1905.
(*b*) Inulin not fermented. In chains	*Streptococcus* Billroth 1874 emendavit Winslow and Rogers 1905.
II. Pigment present. In irregular groups or in capsulated groups of fours. Growth fair to good.	
(*a*) Orange pigment	*Aurococcus* Winslow and Rogers 1905.
(*b*) White pigment	*Albococcus* Winslow and Rogers 1905.

As its cells are arranged in irregular groups and not in chains and are not encapsulated, and as it produces a fair amount of growth on nutrient media and has typically an orange pigment and is a parasite, the organism which we are considering belongs to the genus *Aurococcus* Winslow and Rogers 1905.

Specific Determination.

Under the genus *Aurococcus* Winslow and Rogers have ranged three species, which may be differentiated by the brief characters shown in the following table made by the Winslows:—

(*A*) *Nitrates not reduced:*
(1) Gelatine strongly liquefied *Aurococcus aureus* (Rosenbach 1884).
(2) Gelatine not liquefied ... *Aurococcus aurantiacus* (Cohn 1872).

(*B*) *Nitrates reduced:*
(3) Gelatine may or may not be liquefied ... ... *Aurococcus mollis* (Dyar 1895).

It will be obvious from a study of the above reactions that the organism which we are at present considering agrees as regards nitrate reduction and gelatine non-liquefaction with one of the varieties of *Aurococcus mollis* (Dyar 1895).

We have, unfortunately, been unable to refer to Dyar's original description and are therefore compelled to restrict our observations to the characters given by Migula, the Winslows and Kligler, and will begin with the definition given by the Winslows, which is as follows:—

"*Aurococcus mollis* (Dyar 1895) emendavit Winslow 1908: A parasitic coccus, living normally on the surfaces of the human or animal body or in diseased tissues; often found in the air.

Occurs singly or in pairs, or in irregular groups, rarely in short chains. Reaction to Gram stain variable, more often positive than not. Good to abundant surface growth of orange colour. Acid production moderate in dextrose and lactose broth. Nitrates reduced to ammonia or nitrites or both.

Growth generally equal at 20 and 37 degrees; pigment production equal or better at 20 degrees. Gelatine usually liquefied rapidly; rarely not liquefied."

It will be observed that the organism which we are describing differs in no point from this definition and we therefore conclude that it is *Aurococcus mollis* (Dyar 1895), as defined by the Winslows in their work published in 1908.

It now behoves us to consider the reactions given by Dyar for this organism, which he named '*Merismopedia mollis*.

Migula, who called it *Micrococcus mollis* (Dyar 1895) emendavit Migula 1900, described its characters in German, of which the following is a translation:—

"Coccus, sometimes somewhat elliptical, about one micron n size, single, in twos or fours, or exceptionally in chains of 4-6 individuals and regularly in groups. Gelatine quickly liquefied. Milk was coagulated, and the precipitated casein little by little dissolved. Nitrate was also reduced. Lactose-litmus and Rosolic acid were not altered. It produces on agar a well-marked shining orange colour. In the air of New York."

The Winslows consider that there must be some error in observation or description in the statement that the lactose-litmus was not reddened because the milk was coagulated and the clot liquefied, and no other case has been recorded in which a coccus has coagulated milk except by acid production.

Chalmers and O'Connor noted that it sometimes coagulated milk, merely decolorizing, without preliminary reddening, the litmus, but acid was always formed. This may be the explanation of Dyar's description, but as Chalmers and O'Connor pointed out, the action on lactose is sometimes slight and sometimes more marked, and this is supported by our own observations which show little production of acid and little production of clot in milk. All the strains classified by Kligler as *Aur. mollis* produced acid in lactose media.

It therefore appears probable that different strains vary in their power of fermenting lactose and in coagulating milk, but the differences form a series and not a sharply defined character. In fact, in a definition of this organism the lactose and the milk reactions are too variable to make specific characters.

With regard to the liquefaction of gelatine, the Winslows report that in their study of the Aurococci they found thirty-five out of a series 180 which reduced nitrates, and among these thirty-five nitrate reducers, five only which failed to liquefy gelatine, *i.e.*, 14 per cent, while in our investigations non-liquefaction has been found three times in nine observations, *i.e.*, 33 per cent. There is thus a gelatine non-liquefying strain in the main nitrate-reducing type, as the Winslows have pointed out, but this is not sufficient to make a new species, because the liquefying and the non-liquefying varieties are linked together by slow liquefiers, as Kligler has pointed out, and the same state of affairs is found in strains of the species belonging to the genus *Albococcus*.

It may, therefore, be concluded that at present, at all events, there is not sufficient evidence upon which to base a new variety of *Aurococcus mollis*, still less to form a new species, and we therefore can find no specific difference between the organism we are considering and *A. mollis* as defined by Dyar and by the Winslows.

We now pass on to the consideration of the differences between our present organism and the reactions given by Chalmers and O'Connor for the organism isolated from "*Pyosis Corletti*," and for this purpose we attach a list of the known reactions of these organisms in Tables I and II, in which it will be seen that the only differences are:—

(1) The liquefaction or non-liquefaction of gelatine.

(2) The fermentation or non-fermentation of xylose.

The first has already been sufficiently considered above, and with regard to the second the remarks already made about the fermentation of lactose may probably be found to apply here when more strains have been studied.

For purposes of easy comparison we tabulate some of the reactions of the organisms of Nile boils and Pyosis Corletti, together with the known reactions of *Aurococcus mollis* in Table I.

Pathogenicity.

Kligler in 1913 found it to be the organism contained in the variously named growths which he

COMPARATIVE TABLE I.

The Reactions of the Organisms of *Nile Boils*, *Pyosis Corletti*, and *Aurococcus Mollis*.

No.	Reaction	Nile Boils	Pyosis Corletti	Aurococcus mollis
1	Morphology	Coccus	Coccus	Coccus
2	Gram's stain	Positive	Positive	Usually positive
3	Condition of growth	Facultative anaerobe	Facultative anaerobe	Facultative anaerobe
4	Colour	Orange	Orange	Orange
5	Nitrates	Reduced	Reduced	Reduced
6	Gelatine	No Liquefaction	Liquefaction	Liquefaction, slight liquefaction or no liquefaction
7	Broth	General turbidity	General turbidity	General turbidity
8	Glucose	Acid	Acid	Acid
9	Lactose	Acid	Acid	Acid
10	Saccharose	Acid	Acid	Acid
11	Litmus milk	Slight acid, slight clot	Acid, clot	Acid or slight acid, clot
12	Habitat	Parasitic	Parasitic	Air and parasitic

found among the specimens of the American Museum of Natural History in New York, and believed to come from cases of *acne*, *mammary abscess*, *furunculosis*, and *subcutaneous abscess* in man and from a case of abscess in a horse.

Chalmers and O'Connor in 1915 found it in cases of "*Pyosis Corletti*" in the Anglo-Egyptian Sudan, and we now report it as present in "*Nile boils*" in the same region.

It may, therefore, cause "*bullous eruption*" and "*suppuration*" in the form of boils or abscesses in man in Africa and America, and may also cause *suppuration* in equines.

NILE BOILS AND PYOSIS CORLETTI.

In order to demonstrate the close relationship of the organisms of Nile boils and Pyosis Corletti we list in Table II some further reactions not included in Table I.

COMPARATIVE TABLE II.

Extra-reactions of the Organisms of Nile Boils and Pyosis Corletti.

No.	Reaction	Nile Boils	Pyosis Corletti
1	Levulose	Acid	Acid
2	Galactose	Acid	Acid
3	Xylose	No acid	Acid
4	Maltose	Acid	Acid
5	Arabinose	No change	No change
6	Raffinose	No change	No change
7	Dextrine	No change, rarely slight acidity	No change
8	Inulin	No change	No change
9	Glycogen	No change	No change
10	Amygdalin	No change	No change
11	Salicin	No change	No change
12	Helicin	No change	No change
13	Phlorrhizin	No change	No change
14	Erythrite	No change	No change
15	Adonite	No change	No change
16	Dulcite	No change	No change
17	Isodulcite	No change	No change
18	Mannite	No change	No change
19	Sorbite	No change	No change
20	Neutral red	No green fluorescence	No green fluorescence
21	Indol	Absent	Absent
22	Voges - Proskauer reaction	*Nil*	*Nil*
23	Potato	Good orange growth	Good orange growth

Treatment.—The only reliable treatment is vaccine therapy. The strength of the vaccine which we have found to be most satisfactory is one of *five hundred millions*, of which usually two injections are sufficient to effect a cure.

Prophylaxis.—Two points in the prevention of boils may be mentioned, viz., to attempt to preserve the general health of the resident in the Tropics by good food and good sanitary conditions, and to use some mild non-irritating antiseptic in the daily bath, and for this purpose a weak solution of sodium or potassium permanganate is useful.

In a threatened attack, disinfection of the skin with a weak lotion of salicylic acid dissolved in alcohol or in alcohol and water is worthy of a trial in order to prevent the spread of the boils.

Correction.—In the paper on Pyosis Corletti by Chalmers and O'Connor, a typographical error occurs in the paragraph dealing with the differences between *Aurococcus mollis* and *A. aureus*, where it is stated that it (*A. mollis*) ferments mannite, which *A. aureus* is usually said not to do. The sentence ought to read "it (*A. mollis*) does *not* ferment mannite, which *A. aureus* is usually said to do."

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SEPTEMBER 15, 1915.

TROPICAL MEDICAL SCHOOLS AND DIPLOMAS.

At the period of the year when the various medical schools and colleges are advertising their courses of instruction, the Schools of Tropical Medicine are falling into line and putting forward their claims to usefulness. They are really post-graduate institutions, for no one who does not possess a medical degree or diploma is admitted. In this sense they stand unique, for as yet no other medical school in this country has a post-graduate course which bestows diplomas for the information they impart, unless we include those of hygiene and public health.

The students, moreover, who congregate in these tropical schools are, or have been up to now, men of mature years—frequently between 35 and 50 years of age—who after extended experience in tropical climates come for scientific and systematic instruction in their life's work. For such men the opportunity afforded is of great interest, and they take up their work with an avidity which bitter experience has shown them the necessity for. After long groping in the uncertain field of knowledge which mere clinical study affords, they welcome laboratory work and the teaching of masters in the different fields of study which tropical medicine has created and pressed upon the notice of the medical profession. Thrown on their own resources in difficult situations, where further advice is often impossible to obtain, their responsibilities have burnt into their minds the desire for more exact knowledge and the imperative necessity of becoming acquainted with laboratory methods to aid them in their clinical work. The tropical practitioner is a general practitioner in the truest sense of the word. Medicine, surgery, and obstetrics are to each and all of them, except the favoured few in large cities in the Tropics, part of their daily work, and they require to be experts in all if they are to do their duty to the communities amongst which they labour. They require to be specialists in eye, ear, skin, and other branches of work, for serious cases of the kind included in these specialities continually crop up for treatment.

Where, then, is the post-graduate teaching for these men to begin and where should it end?

Unfortunately there is but little time to study all of these. Leave, which should be spent in recuperating from the effects of trying climates, or it may be actual disease, has to be given over to close study, and the subject they choose is that which is found the greatest necessity for. As a rule, most choose tropical medicine, at any rate on the first leave obtainable, and at the end of the course a stiff examination has to be passed if they wish to crown their labours with a diploma. A severe ordeal is thus entailed which, to men whose vital standard is lowered by prolonged exposure to a hot and moist climate, is severe indeed.

It was a wise step the Colonial Office authorities took when they insisted that their nominees for the Colonial Medical Service should take out a course at either the London or Liverpool Schools of Tropical Medicine before appointments in the Service are confirmed. A further advance in the same direction was made when commercial firms having a large number of native labourers on their estates in the Tropics chose the men for medical charge of their estates from amongst those who have been certified as proficient in knowledge in the diseases of the Tropics. No doubt this demand will be increased, and doctors appointed to ships carrying passengers to and from the Tropics will be granted

appointments and increased pay when a diploma or certificate in tropical medicine is held.

Diplomas and degrees are obtainable through several channels. In the London University tropical medicine is one of the six branches in which the M.D. degree may be obtained. The London Conjoint Board of the Colleges of Physicians and Surgeons admit for examination candidates for the diploma who present evidence of having attended (subsequently to obtaining a registrable qualification in medicine, surgery, and midwifery): (1) Practical instruction in bacteriology, parasitology, medical zoology, and hæmatology, in a laboratory recognized for this purpose during not less than six months; (2) instruction in hygiene applicable to tropical countries; (3) the clinical practice of a hospital recognized for the study of tropical diseases during not less than six months. These conditions may be modified in the case of candidates who have had practical experience in tropical countries deemed likely to have furnished them with the same kind of training.

The University of Edinburgh examinations are open to those who are graduates of the University in medicine and surgery, and to registered practitioners who have had experience of tropical diseases in a tropical country. In addition to this the candidates must show that they have attended approved courses of instruction in practical bacteriology in diseases of tropical climates (including the zoological characters and life-history of disease-carrying insects), in tropical hygiene, and in clinical study of tropical diseases.

The University of Liverpool grants diplomas to students who have taken out a course of tropical medicine in the Tropical School of the University and who pass an examination, in tropical medicine and pathology, tropical sanitation, entomology, on clinical cases in the wards of the hospital, and an oral examination on general subjects appertaining to medical practice in hot climates.

The University of Cambridge allows those to enter for the examination for the diploma in tropical medicine who have studied at a tropical medical school. The following subjects are included in the examination:—

(1) The methods of pathological and bacteriological investigation. The examination of the blood. The characters, diagnosis, and life-history of animal and vegetable parasites. The examination, chemical and microscopic, of poisonous or contaminated foods and waters.

(2) The origin, pathology, propagation, distribution, prevention, symptoms, diagnosis, and treatment of the epidemic, endemic, and other diseases of tropical climates, including malaria, blackwater fever, trypanosomiasis, relapsing fever, dengue, yellow fever, plague, tetanus, beriberi, dysentery and hepatic abscess, cholera, enteric fever, Malta fever, and specific diarrhœal affections of the Tropics; diseases due to cestode and other worms; filariasis; bilharzial disease; specific boils, sores, and other cutaneous affections; mycetoma; ophthalmic affections of the Tropics; affections caused by poisonous plants and animals, and by poisoned weapons; sunstroke.

(3) The general effects on health in the Tropics of seasons and climate, soil, water, and food. Personal hygiene, acclimatization. Principles of general hygiene, with special reference to food supplies and water supplies, sites, dwellings, drainage, and the disposal of refuse. The sanitation of native quarters, camps, plantations, factories, hospitals, asylums, gaols, pilgrim and coolie ships. Principles and methods of disinfection.

The London School of Tropical Medicine grants a certificate at the end of each session to those of the students who have attended the course and satisfied the examiners that they have a satisfactory knowledge of all departments of tropical medicine. At the School advanced instruction in entomology, helminthology, and parasitology is given to those specially interested in these departments. Lectureships in tropical medicine have been established at most medical schools and universities in the kingdom, but with one or two exceptions there is no systematic course or laboratory instruction given.

Annotations.

Splenectomy for Hæmolytic Icterus (Elliott and Kanavel, *Surgery, Gynæcology and Obstetrics*, July, 1915).—Of the forty-eight cases collected by Elliott and Kanavel only two died, one shortly after operation, and the other in six weeks, from sepsis. The forty-six patients who recovered are reported as "cured," that is to say, they were relieved of their jaundice and crises. The effect on the blood picture was immediate. In seven cases in the first two weeks four gained from one to two million reds; in eight cases in the third and fourth weeks three gained over a million, two over two million, and one over three million; in ten cases in from three to six months five gained a million, four three million, and one five million; and, finally, of eleven after six months one gained one million, five two million, and four three million, leaving one that had not gained appreciably, but the blood count here showed four and a half million. These increases in every case brought the blood approximately to normal; in twenty-two cases it was above four million, and of these, in seventeen above four and a half million, and in three six million or over. The hæmoglobin followed the rise in the number of reds. The white blood count was normal unless there were complications. The effect on the fragility of the red blood cells was less conspicuous. The fragility was increased before operation in every case, varying from 0·50 to 0·70. One case is mentioned in which the condition became normal in five weeks, but for the most part little change was noted before three months, when several are mentioned as being nearly normal. The jaundice decreased in most cases in the first few days, and in nearly all instances was absent at the end of two weeks, while the acholuric crises, with the attendant malaise, headache, and fever, ceased entirely.

Alkalinity of Blood in Kala-azar and Cholera (L. Rogers and A. J. Shorter, *Indian Journal of Medical Research*, No. 4, 1915).—A consideration of sixteen unselected cases brings out the fact that, apart altogether from the occurrence of uræmic symptoms, there is a constant reduction of the alkalinity of the blood in cholera which is of a very marked character in all but the very mildest cases, and the degree of which increases steadily with the severity of the disease. A reduced alkalinity of the blood is, therefore, a most essential and important feature of the blood changes in cholera, and one which requires to be combated in the treatment of the disease. As a matter of fact, for several years past all the cholera cases have been given, as a routine measure, 40 gr. of potassium citrate and 4 dr. of liquor ammoniæ acetatis with a view to maintaining the alkalinity of the blood, and in the hope of reducing the dangers of uræmia. It is thus clear that more active measures are necessary if a dangerous reduction of the alkalinity is to be prevented in severe cases of cholera.

Injections of solutions of sodium bicarbonate are the most generally used and powerful means of raising the alkalinity of the blood, and have been much given in the treatment of the acidosis of diabetes and in post-choleraic toxæmia with suppression of urine. The authors' observations furnish some data regarding the effect of such treatment in remedying the reduced alkalinity in this condition. In the first place, it should be noted that there is a natural tendency for the alkalinity to rise when free secretion of urine is obtained. The effect of sodium bicarbonate intravenously is evident. The data regarding the fatal cases of uræmia indicate that when a very low alkalinity, such as hundredth normal and upward, has been reached, together with nearly or quite complete suppression of urine, for two or more days, even intravenous injections of sodium bicarbonate usually fail to avert death with uræmic symptoms, although the alkalinity may have been much raised by the treatment and life considerably prolonged.

EMBALMING.

Public Health Reports, U.S.A., July 30, 1915, describe methods of embalming and what is essential to effective work. The exact composition of the embalming fluid is of less importance than the method of injecting it, and that almost any of the fluids used will be effective if properly applied.

least six points should be used for the injection, viz., the femoral artery toward the toes, each brachial artery toward the fingers, one common carotid artery toward the head and the same artery toward the heart. The total amount of fluid injected should be 15 per cent. of the body-weight. The solution devised at the Hygienic Laboratory has the following formula: Liquor formaldehydi 13·5 c.c.; sodium borate 5 grm.; water sufficient to make 100 c.c.

Abstracts.

"MORPHINE INJECTOR'S SEPTICÆMIA" ("WHITMORE'S DISEASE").[1]

By H. H. G. Knapp.

In 1912, Major Whitmore, I.M.S., first described[2] the pathological anatomy and etiology of a disease that is met with fairly frequently in Rangoon. It was provisionally termed by him "Morphine Injector's Septicæmia." Since his account appeared it might have been expected that observers in other parts of India and elsewhere would have recorded cases, but the only reference I have come across is a brief note in Castellani's text-book, where it is called "Whitmore's Fever," and is said to resemble glanders.

Clinically, it is an obscure condition, and the diagnosis is generally made only at the autopsy.

P. T., a Burman, aged 28, cultivator. Admitted to jail on September 12 in apparently good health. He remained well till five months after admission, when he complained of cough and fever. On admission to hospital on February 15, temperature was 101½° F., pulse 98, respiration 26. There was cough with pain. Tongue furred. Slight ulceration of tonsils noted. Base of left lung was dull, with loss of breath-sounds and diminished fremitus. Spleen distinctly palpable. Examination of stools, blood, and sputum was negative. Hæmoglobin 75 per cent. Urine normal.

February 19, temperature normal. General condition as before. Physical signs unaltered. Leucocyte count gave: Lymphocytes 21, large mononuclears 3, polynuclears 72, eosinophiles 3, and mast cells 1. From the 20th temperature rose, and there was an irregular pyrexia (99° to 101° F.) for thirty-two days. The physical signs did not alter, but the general condition became gradually worse. A diagnosis of chronic tubercular pleurisy was made. About March 23 the fever became higher and more regular, with a definite evening rise. The percentage of polymorphonuclears fell to 60, and hæmoglobin to 50 per cent. About April 8 fever became more irregular, and continued so till death. Condition becoming worse; physical signs as before. April 18, blood count, leucocytes 6,900, red corpuscles 3,365,000, hæmoglobin 50 per cent., colour index 0·74. April 28, leucocytes, erythrocytes, and hæmoglobin all diminished. Polynuclears rose to 76 per cent. The Arneth count gave a moderate left shift (index 57·6). He sank and died on May 5, after an illness of about twelve weeks.

Autopsy.—Body wasted. No marks of morphine injections. *Right lung:* Extensive pleural adhesions, not very recent. Some congestion of base. The organ contained numerous areas of a grey-yellow colour, of fairly firm consistency, irregular in

[1] Abstracted from the *Indian Medical Gazette*, August, 1915.

[2] *Indian Medical Gazette*, July, 1912; *British Medical Journal*, December, 1912.

outline, varying in size from two or three lines to ½ in. across. These areas had generally a zone of injection around them. *Left lung* presented similar appearances. Pleura were adherent to the diaphragm, and this in turn to the thickened capsule of the spleen; between spleen and diaphragm was a collection of curdy purulent matter. Spleen weighed 39 oz., and contained several caseous nodules and foci of suppuration. Cloudy swelling of liver; there was a small abscess, size of half a walnut, in left lobe.

From the lungs and spleen a motile bacillus was cultivated that gave the cultural characters of that described by Whitmore.

Since 1910 eleven instances of this disease have been met with in the Rangoon Jail. From a consideration of them the following facts emerge.

Etiology.—It occurs in adult males of the poorer class. In nine out of the eleven the patient was an habitual morphine injector. The case above described was an exception in regard to this. Race and occupation indifferent.

Onset and Course.—It is an insidious disease, difficult to diagnose, especially as it occurs chiefly in broken-down morphine and cocaine victims. In one case the patient was not taken ill for five months after admission to prison; in two cases the interval was nearly a year. In others the interval was short, or they were ill when first admitted.

General malaise and fever are early symptoms. The fever is usually irregular, generally not very high. Remissions are common. There may be rigors.

The duration varies from one to three months generally, there are pulmonary signs and symptoms, such as cough, subacute bronchitis, with patchy dulness, especially at the bases, and crepitations. Friction was noted in some cases.

In two instances the spleen was palpable. Abscess formation was met with twice; it may be subcutaneous or intramuscular. Œdema of an arm occurred once; of the legs, several times. Diarrhœa was seen sometimes. Examination of the blood yielded nothing of value.

Pathological Anatomy.—The lesions are highly characteristic, and consist of the "nodules" in the lungs already described. They were seen in ten of the eleven cases, and resembled areas of broncho-pneumonia. They are unlike anything seen in any other disease. These peculiar lesions are not confined to the lungs; nodules exactly like them were seen in the liver in three instances, and in the kidney in one. In one case the lesions were confined to the liver, being absent from the lungs.

Small abscesses, sometimes larger ones, were found several times in the lungs, liver, and spleen. The spleen was enlarged in four cases. Suppurating mesenteric glands, ulceration of the sigmoid, and intramuscular abscesses were met with in different cases. Endocardial petechiæ were noted once.

Commentary.—It is clear that there is a general similarity between this disease and glanders, both in regard to symptoms and pathology. Glanders is (in England, at least) a rare infection in man, and it is not altogether easy to find a really satisfactory description of it, from the clinical and pathological standpoints, in the standard text-books. This Rangoon infection, however, seems to be differentiated from glanders in several points, such as its etiology, since it has no relation to the horse, but has a very close relation to the hypodermic syringe. Again, in human glanders there are very frequently various lesions of the skin, such as erysipelatous rashes, bullæ, pustules, &c. In none of these cases were there skin lesions of this sort. The characteristic nodules that may occur in the liver and kidney have not, to my knowledge, been described in glanders.

Lastly, the Rangoon infection has been shown by Whitmore to be caused by a bacillus with certain definite morphological and cultural characters that distinguish it from *B. mallei*.

In short, the balance of evidence favours the view that this Rangoon disease is a separate and distinct infection. But even if further investigation fail to establish this contention, it may be worth while putting this case on record, since clinical accounts of glanders are rather rare. It is curious that this disease is not oftener described in the medical journals of India, where it is generally believed to be fairly common.

SPECIFIC TREATMENT OF THE MALIGNANT FORMS OF MALARIA.[1]

By C. C. Bass, M.D.

Malignant forms of malaria are those cases of malaria that prove fatal, those that would prove fatal without proper treatment, and those that are sufficiently severe to immediately endanger the life of the patient. The specific treatment of this or any other form of malaria is treatment with quinine. There is no other specific remedy for malaria.

Practically all cases of malignant malaria are due to the æstivo-autumnal plasmodium (*P. falciparum*). This parasite spends about three-fourths of its life-cycle lodged in capillaries and only about one-fourth in the circulating blood. The very fact that it remains during so large a portion of its life in capillaries enables it to produce the severe forms of malaria. It seems quite possible that prevention of the proper flow of blood through the capillaries of vital organs by large numbers of plasmodia lodged in them may be the chief source of symptoms which would lead to the case being classified as one of malignant malaria. For instance, almost all patients have coma for a greater or lesser period before death. Coma is perhaps the most certain symptom indicating a malignant form of the disease. Coma in malaria is due to the anæmia of the brain resulting from the large number of capillaries plugged by malaria plasmodia.

[1] Abstracted from the *Journal of the American Medical Association*, August 14, 1915.

Necessity for Quinine Saturation.

Quinine in the blood does not reach plasmodia lodged in capillaries. If in sufficient concentration, however, it does kill those in the circulating blood. Plasmodia lodged in capillaries come out into the circulating blood after they segment and are thus exposed to the action of any quinine that is in the blood at the time. Since, in æstivo-autumnal malaria there is continuous segmentation—each parasite segmenting independently of others—and continuous appearance of young plasmodia in the blood-stream, it is necessary to keep a sufficient concentration of quinine in the blood to kill them at all times. Whenever a dose of quinine is introduced directly into the blood it appears in the urine in a few minutes. Many individuals eliminate more than 50 per cent. of it within twelve hours and practically all within twenty-four hours. Thus it is seen that in order to have sufficient quinine in the blood at all times to destroy malaria plasmodia as they appear, which they will do for a period of at least thirty-six hours, it is necessary to administer it every few hours during this period.

Methods of Administration.

There are three methods of administration for consideration—by mouth, hypodermically or intramuscularly, and intravenously. Administration by mouth in malignant malaria is frequently impossible on account of the condition of the patient, or if it can be administered it is frequently vomited. Not only may it be difficult to administer in this way, or be vomited, but if retained, absorption in these cases is slow and uncertain. It is likely to be several hours before the quinine reaches the blood-stream where its effect is desired. Many a patient dies with enough quinine in his stomach to have saved his life if it had been given properly.

The next method of administration is introduction into the tissues by means of a hypodermic syringe. We are accustomed to think of the hypodermic as a rapid means of getting drugs into the blood-stream. This is so with many drugs, but it is not so with drugs like quinine which cause severe local damage to, and frequently necrosis of tissue. The least irritating form of quinine—the bimuriate with urea —will produce necrosis of tissue if introduced in sufficient concentration. If more dilute, inflammation only is produced. It is less likely to produce necrosis when injected into the muscle than when injected into loose areolar tissue. The rate of absorption varies with the dilution employed and the tissue into which it is injected, as well, perhaps, as with different individuals. Sometimes some of it reaches the blood-stream in a few minutes, but at best it is many hours before all of the dose injected is in the blood. In case of severe local inflammation it may be many hours or days before the quinine is absorbed, or in case of necrosis it may never be absorbed. Many a patient has died of malaria with more than sufficient quinine in his tissues to have saved his life had it been properly administered.

Whenever quinine is administered intravenously it reaches the circulating blood at once where it is needed, and whatever good can be accomplished by specific treatment begins to be realized. Whenever, as in malignant cases of malaria, the life of the patient depends on getting quinine into the blood-stream quickly, there is no other method to consider.

Intravenous Injection.

The dose and method of administering quinine intravenously are important. It is never necessary to exceed 30 gr. of quinine hydrochloride during twenty-four hours when administered intravenously, nor more than 10 gr. should ever be given at one time. Large doses of quinine given intravenously are very dangerous. Twenty grains often produce considerable shock, dizziness, nausea, &c., and a dose of 50 gr. has killed in several instances. A serious mistake often made in the treatment of the most urgent cases of malaria is the introduction of large and dangerous doses of quinine which are repeated at frequent intervals until the patient dies. In several instances 100 gr. or more of quinine have been administered during the last twenty-four or thirty-six hours before death. Usually, this destructive treatment is continued because the patient continues to get worse. The symptoms attributed to a continuation of the reproduction of malaria plasmodia are usually due to the quinine. Examination of the blood of such patients usually shows few malaria plasmodia and most of them are dead or dying. The necrospy fails to reveal sufficient plasmodia to cause death. In other words, the cause of death is quinine poisoning and not malaria. In view of these statements and ideas, if correct, the amount of quinine given should not approximate the lethal dose. Danger can be further avoided by administering it in several small doses not exceeding 10 gr. at any time. Ten grains of quinine hydrochloride given intravenously every eight hours, or 5 gr. every four hours, will kill plasmodia in the blood-stream and prevent their reproduction as certainly as any larger quantity and will not endanger the life of the patient. It is true that it does not reach plasmodia lodged in capillaries until they segment and their merozoites appear in the blood-stream.

Theoretically, inhalation of amyl nitrite should tend to dislodge plasmodia from the capillaries, and if done after quinine has been introduced into the blood, would expose many of them to the action of the quinine that would not otherwise be exposed.

In most malignant cases of malaria the total quantity or mass of malaria plasmodia produced during a single life-cycle of the parasite is enormous. The volume of an æstivo-autumnal schizont at maturity is about that of a red blood cell. Using this as a basis we may calculate approximately the total volume that would be produced in the body of a patient during the life-cycle of a plasmodium. It is common to find in such cases at least one red blood cell in every five to contain one or more plasmodia. If we assume that a man has 6,000 c.c. of blood, one-half of which, or 3,000 c.c., are red blood cells, there would be produced 600 c.c. or

more than a pint of malaria plasmodia. It is strange, but nevertheless true, that patients often recover when given proper treatment in spite of this enormous amount of foreign protein in their blood-stream. May it not be due to the fact that the protoplasm of the parasite is of very low toxicity?

As soon as a case of malignant malaria passes out of the severe attack, then, of course, the treatment is not different from that of other cases of malaria.

Malarial Hæmoglobinuria.

Malarial hæmoglobinuria may be discussed briefly under the title of this paper. In malarial hæmoglobinuria something occurs which causes hæmolysis of the patient's cells. Cells containing plasmodia, and thus damaged, are affected more certainly and more extensively than the normal cells. As a result they are hæmolyzed, leaving the plasmodia they contained exposed to the plasma, which promptly destroys them. The only object of giving quinine in malaria is to destroy plasmodia, and if most or all of the plasmodia have disappeared, which is the case in hæmoglobinuria, there is no indication for quinine. There is a certain amount of contra-indication, moreover, because quinine tends to increase hæmoglobinuria or to precipitate attacks in otherwise susceptible individuals.

Summary.

The proper specific treatment of malignant or pernicious malaria is quinine administered intravenously.

The dose should never exceed 10 gr. of the hydrochloride.

The total quantity given should never exceed 30 gr. during twenty-four hours.

Malarial hæmoglobinuria does not require quinine. Quinine is harmful in most cases of hæmoglobinuria.

Discussion.

Dr. Walter Brem: An interesting experimental explanation has been offered of the fact that has long puzzled those who have worked with malaria; that is, that the æstivo-autumnal parasites disappear from the blood after the early stage of their development. The pernicious cases can be divided into three groups. In the first group are the cerebral cases, due to plugging of the capillaries of the brain. The second group includes those in which there is intense infection. Determined by the appearance of hæmoglobin in the urine, detected not by the naked eye but by tests for blood in the urine, a 6 per cent. infection of the blood corpuscles is the dividing line between pernicious malaria of the type of intense infection and the non-malignant type of malaria. The capillaries of the brain in these cases often become blocked. I never saw recovery of a patient who became comatose with a 6 per cent. infection of the red blood corpuscles, whereas in the comatose group with less than 6 per cent. infection I have often seen recovery. The third group is the provisional group of the hæmoglobinuric type, the so-called blackwater fever, due to malaria, although that has not been absolutely proved.

From experimental observations Dr. Bass had arrived at the same conclusions as has been reached from clinical observation and pathologic studies at necropsies, namely, that quinine does not reach the parasites lodged in the capillaries of the brain, so that when this occurs to any great extent, recovery is practically impossible.

The only call for the intramuscular injection of quinine, excluding the malignant cases, is when the patient is nauseated and vomits the quinine when given by mouth. Even in the cases in which there is vomiting during the paroxysms, during the intermissions quinine can be given by mouth and is quite effectual. The best routine method of administering quinine to a larger number of patients, is to give it during the early morning hours, when they are not vomiting and can take it best. This is due to the fact that the paroxysms occur in the afternoon in over 80 per cent. of the cases. The quinine in this way is introduced before the sporulation causes the paroxysm. Thirty grains thus given are better than 40 gr. given in 5-gr. doses every four hours and 10 gr. before the paroxysm.

AN OUTBREAK OF ANTHRAX.[1]

By Dr. McCombie.

The paper deals with two outbreaks, one which occurred in 1901, and the other in 1914, both on the same garden, and both associated with anthrax epidemic among the cattle. It also includes three sporadic cases from another garden.

In 1901 the epidemic began in June, and up to the end of August, when it ended, there were eighteen cases and six deaths.

In 1914 it lasted from September to December with thirty cases and seven deaths.

Including the other three cases in all there were fifty-seven cases with thirteen deaths = 25·4 per cent.

Nine of these were cases of internal anthrax, all of which died, leaving forty-two cases of malignant pustule, of which four died, a mortality of 9·5 per cent. for both years.

The mortality in 1901 was 14·2 per cent., but in 1914 it was only half of this, 7·1 per cent. This is attributable to the method of treatment, which, tried tentatively towards the end of the outbreak in 1901, has been more thoroughly carried out from the commencement of the epidemic in 1914.

Of its association with the cattle epidemic there can be no doubt. The fact was established in most cases of either cutting up or eating cattle dead of the disease, the former giving rise to malignant pustule, and the latter to internal anthrax, while some suffered from both.

It by no means follows that eating anthrax cows will be followed by anthrax in the coolie. In one line a cow died one evening, and it was directed to remain unburied until microscopical examination had established the cause of death. One blood slide showed enormous numbers of anthrax bacilli,

[1] Abstracted from the *Indian Medical Gazette*, August, 1915.

but next morning the cow had disappeared, and was reported to be in pieces, all over the line. No case of anthrax came from that line, except a malignant pustule three weeks later.

On the other hand, cases frequently occur together in one house after eating infected flesh, or in different houses traced to eating the same carcase. Thus, Cases 1 to 11 of 1914 all admit sharing two cows dead of an unknown cause, while of these cases 4, 5, 10, and 11 were in the same family. Cases 20 and 21, not related, had pieces of the same buffalo. Instances like this are common.

One may also note that all the cases except one occurred in meat-eating castes. The only exception was the hospital cook, who had a malignant pustule, and who may have been accidentally infected from cases in the hospital.

The age of the cases runs from 3 to 50, but were mostly adults.

Curiously enough only one female was affected and she internally, explained by the fact that the men do the cutting of the raw flesh, while the small boys help to carry home the spoils, and the men likewise eat the lion's share of the meat. It is quite easy to understand that if the meat has been kept until spores form, it would require very thorough cooking to render it sterile.

Symptoms.—The forms of anthrax described are:—

A. External—including (*a*) malignant pustule and (*b*) malignant œdema.

B. Internal—described in two forms—

(*a*) Intestinal;

(*b*) Pulmonary (wool sorter's disease).

The pulmonary form is not met with in Assam.

Malignant œdema is practically the same as the tremendous inflammatory œdema, which frequently accompanies a malignant pustule, but without showing any definite focal lesion. They are usually fatal.

Malignant pustule formed 82 per cent. of the cases, and the intestinal forms composed the balance. Some of the latter had malignant pustule as well.

With regard to *malignant pustule* the situation of the lesion was as follows:—

Out of 42 cases 21, or 50 per cent., were in the upper extremity (mostly on the forearm) of which 3, or 14 per cent., died.

9 on the lower limbs with no deaths;

6 on the head, neck, and face with 1 death, or 16 per cent;

5 on the body with no deaths;

1 had two pustules on the buttock and arm.

Of these 42 cases and 4 deaths, 2 died without treatment, giving us 40 cases of malignant pustule under treatment with 2 deaths—a mortality of 5 per cent., which is quite good.

The incubation period, as far as could be ascertained, was from three to six days after handling the infected flesh.

One attack apparently does not establish a permanent immunity, as one man, who had a malignant pustule in 1901, died of internal anthrax in 1914.

The pustule begins with an itching, burning sensation at a spot, which soon becomes a livid red papule which vesiculates and forms a rough black central slough, usually surrounded by a zone of small vesicles or pustules. It is early surrounded by an area of brawny inflammatory œdema, which varies greatly in extent according to the severity of the attack. Neighbouring glands are inflamed and the temperature usually rises on the second day to between 102° and 104° F. with symptoms of constitutional disturbance, and in the majority of cases remains high for two or three days with slight remissions, and then rapidly falls to normal. In fatal cases the temperature does not fall and symptoms of toxæmia develop and are rapidly fatal. Two cases in whom the temperature fell to normal and were apparently doing well, died of syncope two or three days later.

The cases vary much in severity and one sees a typical pustule, with only slight swelling and no fever, which rapidly heals up.

The symptoms of internal anthrax are given in the text-books as those of intense poisoning: chill, fever, vomiting, diarrhœa, pains, and later dyspnœa, cyanosis, and restlessness.

In the cases seen, although *post-mortem* showed intestinal lesions, vomiting was rare and diarrhœa not noted.

Case 9 was a woman who was carried into hospital in a restless condition, saying she had had fever during the night. Her appearance was very anxious, temperature subnormal, body covered with perspiration, and she complained of pain in the abdomen and over the cardiac area. Pulse irregular and small.

She died suddenly within half an hour. A routine blood slide showed anthrax bacilli.

Case 29, a man, came in with high fever, complained of pain in the abdomen, and said he had vomited several times. There was much distension and flatulence. He was dead in one and a half hours. There were no anthrax bacilli in his blood, but *post-mortem* proved it to be anthrax.

Cases died quite suddenly in the lines, and the only history one got frequently was that they had been feeling ill the day before, and got fever during the night and died.

There is nothing distinctive about the symptoms in my experience.

Diagnosis.

The *malignant pustule*, once one has seen a case, gives no difficulty in diagnosis, and if the pustule is not typical the intense brawny infiltration all around gives one the clue, and the bacilli are easily found under the microscope in a smear of the serum from a pustule.

The *internal cases* are very puzzling, if one is not expecting them. It is one of the causes of so-called sudden death in the lines. When seen in the collapse stage they can hardly be diagnosed clinically. Without a blood examination they may be called high fever, and Case 29 suggested acute obstruction.

Case 29 showed no bacilli in the blood, but the

bacilli are usually quite easily found, so a routine blood examination should always be done.

The *post-mortem*, however, always clears up the diagnosis, and a spleen smear is always swarming with bacilli.

The *post-mortem* findings are fairly distinctive, although in 1901, when the second of these mysterious deaths had occurred, the diagnosis made *post-mortem* by the Civil Surgeon (in the absence of a microscope) was septicæmia of unknown origin, and only on collateral evidence was anthrax subsequently suspected and found microscopically in subsequent cases.

Briefly, one finds on opening the abdomen a large quantity of free straw-coloured fluid, with sometimes flakes of lymph all over the coils of intestine. There is a peculiar jelly-like œdema of the mesentery, and the mesenteric glands are large, swollen, and hæmorrhagic. The peritoneum covering the bowel is congested and may show petechiæ, but the typical lesion appears to be numerous submucous hæmorrhages into the wall of the bowel, which may be very extensive and destroy the mucous membrane, and are easily seen by holding up the bowel to the light, when they appear like black patches through the empty intestine.

The spleen is congested, dark, swollen, and soft, and may be diffluent. It swarms with bacilli.

The heart blood is thick and tarry, and the lungs and pleura are congested and may show petechial hæmorrhages.

Treatment.

The treatment of the *internal cases* is hopeless, although recoveries have been reported with intravenous injections of Sclavo's anti-anthrax serum. Carbolic internally in large doses, with big doses of strychnine, had no apparent results.

For *malignant pustule* excision and actual cautery have their advocates, but the former is liable to be followed by a general infection and the latter is difficult to carry out in most hospitals.

Sclavo's serum with or without excision is strongly recommended at home.

Another treatment recommended, which has the advantage of being simple, is cauterization with solid caustic potash. A series of seventy-five cases with four deaths is reported, and it certainly seems worthy of trial and without the disadvantages of the treatment now to be described.

My practice is as follows:—

In mild cases without fever, or cases seen after the fever has subsided and obviously clearing up, almost any treatment suffices, touching with pure carbolic and antiseptic compresses, or a crucial incision with the application of pure carbolic in the moderately severe cases.

In bad cases with high fever and much inflammatory œdema the following method has given excellent results, and no time should be lost in carrying it out. All around and underneath the pustule 50 per cent. carbolic acid is injected with a hypodermic needle at close intervals. The idea of the treatment being that the pustule is shut off from the circulation by a zone of carbolized slough, which seems to effectually prevent the infection becoming generalized.

It is not very painful and is a method available in any hospital, but it has the disadvantage of forming a big slough which has to be separated off, which takes about a week or ten days and about three weeks to heal.

No case was lost in which this has been done properly.

Prophylaxis.—The cattle or horse epidemic must be dealt with vigorously, when the cases among the coolies will cease automatically, except perhaps for an occasional sporadic case.

The symptoms in horses and cattle are very acute, swelling of the throat and high fever, 104° to 106° F. in the rectum. There may be only high fever and no swelling, and very commonly cattle die suddenly during the night. In any case the course of the disease is short and usually fatal.

In any suspicious case the diagnosis may be rapidly made after death with the microscope by cutting the ear and obtaining a blood slide, which shows the typical bacilli.

With regard to treatment for horses, dissolve 1 dr. of acid carbolic in 4 oz. of water and inject into the swelling and all around the neighbourhood in the side of the neck. Do this every four hours night and day for the first thirty hours, and then every six hours until the swelling subsides.

No time should be lost over individual cases when the diagnosis has been made, but all cattle that have been in contact with infected animals should be inoculated.

The period of immunity varies greatly, due to susceptibility of the animal and virulence of the organism at the time, so anything from three to eight weeks. Animals should be re-inoculated after a month with double doses, which protects over three months.

With regard to the carrying of infection, the risk to other ponies on the polo ground is very slight (*i.e.*, of ponies coming from an infected garden and apparently healthy), practically *nil*. Contaminated earth *might* be carried on the ponies' feet. Arrangements might be made to wash them before they leave.

It is not contagious; animals becoming infected by eating grass or drinking water containing spores. The infection is kept alive and spread by means of the spores, which are very resistant and will survive for years in the soil; and one should remember that spores are only formed when blood or discharge containing the bacilli escapes and is exposed to drying, sunlight, or adverse circumstances. Hence the carcase should not be opened or cut. The bacilli are aerobic and if deprived of air soon die, especially in contact with the anaerobic organisms of putrefaction in the carcase.

All carcases and material stained by blood or discharge from infected animals or carcases should be burnt or buried deeply after sprinkling with lime (unslaked) or disinfectants.

The most important thing on a garden is to get early intimation of cattle deaths to prevent coolies getting the meat for consumption.

Original Communications.

BABESIA OR PIROPLASMA: A REPLY TO DR. LEIPER.

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AND

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DR. LEIPER, in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, January 1, 1915, has pointed out that in suggesting that Piroplasma was the correct name for the organisms often termed Babesia, it had escaped our recollection that the nomenclatures of botany and zoology are quite independent.

We had not intended replying to this, nor have we the slightest intention of entering upon a polemic with regard to the above nomenclature, but as Dr. Leiper's words have been quoted in other journals, and may possibly give rise to a wrong impression, we feel compelled to make these few final remarks on the subject.

There is no one who will dispute that a worm is an animal and that a moss is a plant, but with regard to the Protista the matter is quite different, and one set of authorities may declare that a given organism is an animal and therefore comes under the rules of zoological nomenclature, while another equally weighty set of authorities may maintain that it is a plant, and that it comes under the rules of botanical nomenclature.

This point can be illustrated by one of the terms used for the Piròplasmata. Babès, in 1888, gave the organism which he discovered the name of *Hæmatococcus* or blood coccus (*C.R. Acad. Sci.*, Paris, vol. cvii, p. 692), but unfortunately this name has not been adopted because Agardh, in 1828 ("Icones Algar. Europ."), had already given the same name to another organism.

By general consensus of opinion Babès "coccus" is considered to be an animal, but what is Agardh's organism? By one set of authorities it is considered to be an Alga and, if so, then the correct name for the organism we call *Piroplasma* or *Babesia* would be *Hæmatococcus*. On the other hand, equally good authorities look upon it as a protozoal organism, and we have it on the authority of a distinguished protozoologist that he does not envy the task of the investigator who would try to settle this point.

By general usage the coccus of Babès has been deleted because of Agardh's coccus, and, therefore, there is no evident reason why the same should not happen to the word Babesia, especially as Saccardo's description leaves it, in our opinion, open to doubt as to the true nature of Trevisan's *Babesia xanthopyretica* found in yellow fever, and presumably the type species, which may or may not be a streptococcus (Filamentis undulato-flexuosis 0·6-0·8 μ diam. longissimis), and apparently no one has, as yet, seen the true causal organism of yellow fever.

We readily admit that the nomenclature of the organism called Piroplasma is extremely confused, and that very long papers could be written on the subject, but we still maintain that as far as the evidence at present goes, the correct term is "Piroplasma," though it is possible that further research might give preference to "Pirosoma."

In order that the reader may be able to judge for himself we quote, in its original French, the zoological rule to which Dr. Leiper refers, and which reads as follows:—

"Article Premier: La nomenclature zoologique est indépendante de la nomenclature botanique, en ce sens qu'un nom d'animal ne peut être rejeté pour ce seul motif qu'il est identique à un nom de plante. Mais, si un être est transporté du règne végétal dans le règne animal, ses noms botaniques sont incorporés à la nomenclature zoologique avec tous leurs droits à la priorité. Si un être est transporté du règne animal dans le règne végétal, ses noms zoologiques sont maintenus dans la nomenclature zoologique.

"Recomm.: On doit éviter d'employer, en zoologie, des noms génériques existant déjà en botanique."

With reference to the confusion in the nomenclature of the Protista there is an excellent botanical rule which the zoologists would do well to copy, and this reads as follows:—

"Art. 4. The essential points in nomenclature are: (1) To aim at fixity of names; (2) to avoid or to reject the use of forms and names which may cause error or ambiguity or *throw science into confusion*."

It will be observed that this extremely wise rule uses the term "science" and not the term "botany."

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NOTE ON "BOOMERANG LEG."

A BONE DISEASE OCCURRING AMONGST AUSTRALIAN ABORIGINALS.

By A. BREINL and H. PRIESTLEY.
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ERNEST BLACK, as quoted by Castellani and Chalmers[1] drew attention to a disease occurring amongst natives in Western Australia, the Northern Territory, and the Torres Straits Islands, characterized by a bowing forward of the bones of the legs.

Sporadic cases were observed by us amongst the natives of North Queensland and of the western parts of British New Guinea.

[1] Castellani and Chalmers, "Manual of Tropical Medicine," London, 1913.

The disease has for some time been known as "boomerang leg," on account of the similarity of the shape of the legs to that of a boomerang. It affects young natives of both sexes and the resulting deformity persists throughout their life, and in every case seen both legs were affected.

The onset seems to be gradual; the children complain at first of pains in the shins, sufficiently severe to prevent them from walking. The skin over the tibia is tender to pressure, but there is no swelling noticeable. These pains become less severe in the course of time, the children begin to use their legs again, and the tibiæ and fibulæ bend forward gradually and assume the characteristic shape. In consequence of this the centre of gravity of the body is displaced forward, the patient becomes flat-footed, and the gait shuffling. The deformed bones gradually increase in thickness, but retain their altered shape.

We were fortunate enough to obtain an X-ray photograph of the leg of an affected Queensland aboriginal and the bones after his death.

The native was about 40 years of age (fig. 1) and had developed the disease in his early youth. He died from pneumonia, and the *post-mortem* did not reveal any obvious signs of syphilis, tuberculosis, or rickets. Both tibiæ and fibulæ were markedly curved, with the convexity forwards and the point of maximum curvature lay between the upper and middle thirds. The tibia was heavier than normal, greatly increased in diameter, the crista completely obliterated, and the bone almost circular on cross-sections at the middle of the shaft (cf. fig. 2, A). The fibula did not show any changes beyond a corresponding forward curvature.

A longitudinal section through the middle of the tibia (fig. 2, B) shows a complete alteration of the structure of the bone. The compact substance is greatly increased in thickness over the greater part of the shaft and is slightly decreased at both extremities. It is much denser in structure than normal and is of ivory-like appearance. Almost the whole marrow space is filled by compact bony tissue, only here and there are remnants of greatly thickened cancellous tissue. The lamellar structure of both ends of the bone has become completely obliterated, being transformed into compact bony substance.

The X-ray picture taken during life shows the same transformation (cf. fig. 3).

The history of the disease in conjunction with the appearance of the bone suggests that "boomerang leg" is the result of a chronic osteomyelitis of both tibiæ. It takes, at first, the form of a rarefying osteitis, corresponding clinically to the early and painful stages of the disease and giving rise to the softening of the bone and the characteristic deformity. This phase is followed later by a condensing osteitis, where the increased activity of the osteoblasts leads to a progressive thickening of the lamellæ, to bony metaplasia of the fibrosed marrow, and to the reduction of the marrow spaces.

A simultaneous progressive periosteal new development causes the increase in the thickness of the shaft.

The etiology of "boomerang leg" is unknown, but syphilis and tuberculosis can be excluded.

FLAGELLATE FORMS OF *LEISHMANIA DONOVANI* IN THE TISSUES OF AN EXPERIMENTALLY INFECTED DOG.

By C. M. Wenyon.

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In 1911 Escomel first recorded his discovery of flagellated or leptomonas forms of leishmania in smears made from cases of South American dermal leishmaniasis. Since that time such forms have been noted by La Cava in cases of Oriental sore in Italy, and by Monge again in the South American disease. Though search has been constantly made for such flagellate forms in cases of kala-azar no one has been successful in demonstrating their presence in the blood or tissues from cases of this disease. It seems worth while, therefore, to place on record the following observations.

In September, 1913, I inoculated a dog with spleen emulsion of a man who died in the Albert Dock Hospital from kala-azar contracted in Calcutta. The dog became infected and I have maintained the strain of leishmania by sub-inoculation in dogs. In all there have been up to the present five passages in dogs. On July 29 of this year I

inoculated a young dog intraperitoneally with emulsion of the spleen of a dog of the fourth passage. A month after the inoculation the dog showed signs of illness, and was evidently dying on September 4. It was accordingly killed and an examination made immediately after death. Leishmania were fairly numerous in the bone-marrow and there were a good number of large cells with cytoplasm packed with parasites. As is usual in dogs, the leishmania showed a much greater variation in form and size than they do in men. Frequently there occur what are, comparatively speaking, very large forms, as much as 8 or 9 microns in longest diameter.

From this it would appear that Yakimoff and Schokhor (*Bull. Soc. Path. Exot.*, March, 1914) are hardly justified in separating the *Leishmania tropica* of Turkestan into several varieties, according to the size of the parasites. A similar variation in the size of the leishmania I noted in the natural canine kala-azar of dogs in Malta.

FIG. 1.

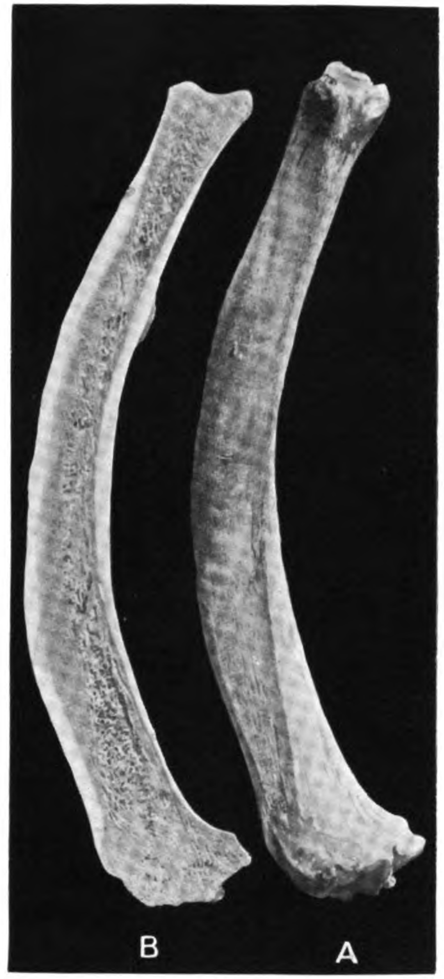

FIG. 2.

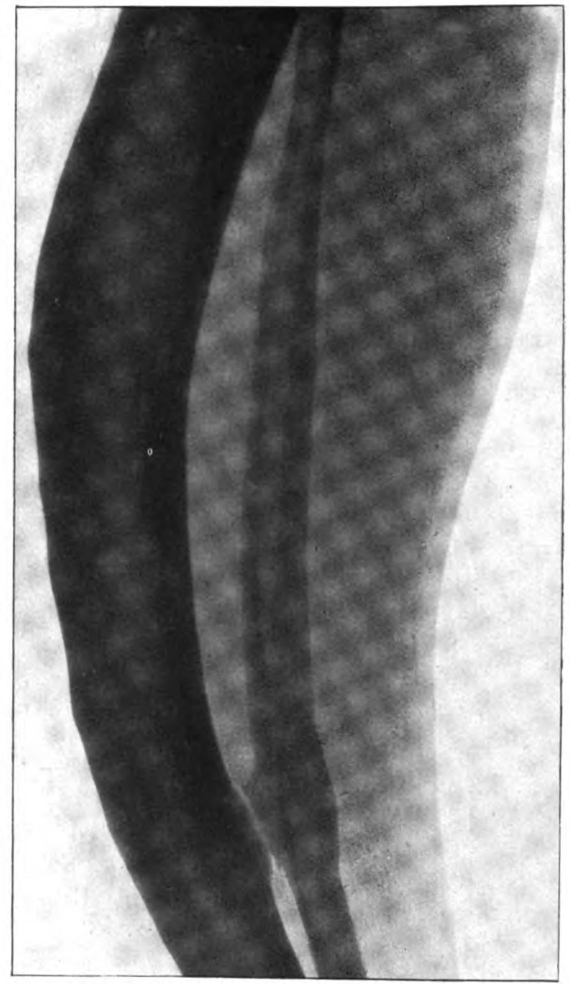

FIG. 3.

To illustrate paper, "Note on 'Boomerang Leg': a Bone Disease occurring amongst Australian Aboriginals," by A. BREINL and H. PRIESTLEY.

In the present case, however, side by side with the typical leishmania, occur a few characteristic flagellate leptomonas forms—such as appear in cultures of leishmania in N.N.N. medium. These have been found in smears of the bone-marrow. The accompanying drawing shows three leishmania and two leptomonas forms, as seen in one field of the 1/12 objective. One of the flagellates is in process of longitudinal division. The magnification is approximately 2,000.

There seems little doubt that these organisms are flagellate forms of *Leishmania donovani* of Calcutta origin, which has passed successively through five dogs. It would appear that a strain of *L. donovani* can be maintained indefinitely in these animals.

Rupture of the Kidney: Two Cases (N. Barth, *Norsk Magazin for Lægevidenskaben*, August).—In both cases the ruptured kidney did not cause much disturbance. Comparing them with those on record shows that considerable and protracted hæmorrhage testifies to a severe lesion of the kidney, but that the organ may also be seriously injured even when there is but little blood in the urine, as the blood may be accumulating outside. The severe hæmaturia in his first case testified to the necessity for prompt operative treatment, and recovery soon followed nephrectomy. The kidney had been torn entirely across; the halves were held together only by the hilus. The abdomen was tender and a tumefaction, increasing in size, could be felt in the kidney region. In the second case the only sign was blood-stained urine after the contusion of the kidney region. The patient was kept in bed on a milk diet and given gelatine. By the ninth day the urine was normal, and he was discharged as cured. After injury of a kidney, the patient should be under constant medical oversight for the first week. If there are signs of injury of the bowel, a prompt operation is the only salvation. The pulse, the temperature, tumefaction and tenderness should be watched from day to day, and it should not be forgotten that hæmaturia may be a symptom of rupture of the ureter or bladder.

Acute Glaucoma developing after Instillation of Holocain and Zinc Sulphate (H. Gjessing, *Norsk Magazin for Lægevidenskaben*, August).—In 1914 a case of acute glaucoma followed at once an instillation of 1 per cent. zinc sulphate, preceded by a local anæsthetic (2 per cent. holocain hydrochloride). The second patient was a man aged 79, subject to acute attacks of glaucoma of the type known as glaucoma with intermittent hæmostasis. The tension in the eye had been 53 mm. of mercury. The two cases teach the necessity for instilling a myotic at once after tonometry if the tension is in the neighbourhood of 50 mm. Both holocain and zinc cause transient hyperæmia in the conjunctiva. Plastinin, of Moscow, has reported a similar case under holocain alone.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 1, 1915.

THE CALL FOR MEDICAL MEN BY THE NAVAL AND MILITARY SERVICES.

THE announcement that it is hoped one-third of the medical profession in the British Isles will come forward and assist in military hospitals before Christmas, 1915, shows that the demand for additional help in the Services is imperative if the sick and wounded in war are to receive the attention they require. Already, however, hundreds of medical men in civil practice have joined the forces, and

the great majority of those who have qualified during the last twelve months have joined the Medical Services of the Navy or Army. Further, as the hospitals and homes for the wounded are scattered throughout the length and breadth of the country, there is scarcely a parish in which the medical men are not giving their services locally, so that it would be well were it stated in what capacity the extra number, which at the lowest estimate must amount to 10,000 men, are to be employed. Are they to devote the whole of their time to military work, thus leaving the civilians doctorless or with, at all events, reduced medical attention? The authorities know best whether this is necessary or not, but on the face of it it appears not necessary this should be so. The medical and surgical staffs in our general hospitals in civil life visit their wards at stated intervals and at such other times as emergency demands; surely the same thing can be done, in the British Isles at any rate, everywhere? Resident medical officers are required in military and civil hospitals, and surely a visiting staff comprised of local medical men can be allowed to fulfil their duty to the public and to the local military hospital at the same time in the same manner as is usual in civil life. We hear, however, of many medical men in the vicinity of a military hospital who offer three to six hours a day of their time, whose assistance, much to their chagrin, has been refused. We hear of medical men of long experience who have come from the Overseas Dominions and the Crown Colonies, who having read the announcements in the papers that doctors are required, have given up their practices and consequently their means of livelihood, and found when they offered themselves for service that they were not accepted. The feeling engendered in these self-sacrificing men by this refusal is one of bitterness, deep and biting, and creates a feeling that come what may they will not again incur the chance of again being, what they call, "insulted." A young doctor of the highest promise, son of a well-known man in the Colonies, finding it impossible to get a place in the medical department of the Army, joined as a private soldier, and met his death in the Dardanelles. As reports go there are several medical men in the same plight, namely, that rather than be out of it they join the ranks. If these reports are true, this is a great waste of strength and good material, especially as the demand, according to the papers, is so great. As pointed out before in our columns, many, if not all, of these disappointments or so-called "insults" are due to the fact that the doctors on joining wish to have a rank and position corresponding with their previous experience and position, and cannot bring themselves to commence as junior officers at the foot of the ladder. This is no fault of the moment, but of the want of a previously considered plan of organization whereby the whole of the civil practitioners should have been enrolled as a possible auxiliary help and reserve in time of war. It is asked, Why was not this done? Against it we had the prevalent *laissez-faire* which dominated the minds of the people of Britain, the hide-bound disregard of everything bearing a semblance to military organization; the apathy, scorn and contempt with which any preparation in the time of peace for war work was regarded; and the belief that war was so remote a contingency that preparations were farcical.

To one unacquainted with military *régime* it seems an easy transition from civil to military work. This, however, is not so. The doctor in civil life has nothing to do with the management and internal economy of the hospital, hospital returns, admission and discharge forms, and the many details connected with the running of a large institution. In military work this is part and parcel of his daily duty, and he has to know as an officer what is expected of the orderlies and nurses under him; and last, but not least, he is the sanitary officer to the hospital, the camp, or the district in which his duties lie. All this means training, which a man coming straight from civil practice does not possess. Yet many men with and without any knowledge of the work of an Army medical officer who is a specialist in his department consider themselves qualified to do his duties. To place in charge of a hospital a medical man who, although quite capable of dealing with the clinical part of the work, is wholly untrained in executive work only leads to mismanagement, adverse criticisms, remonstrances, and dissatisfaction. Hospital management is not, as it might be, part of our general medical training, yet when one comes to think of it, whose duty is it to know how a hospital is managed and how to run it? Surely the doctors ought to know and be educated in the work which is peculiarly theirs. Yet in civil life this is not so, and in the medical profession the only section so trained is the medical department of our Army and Navy.

Who does manage our civil hospitals? A committee of laymen, none of whom have ever been educated to the work, who have other duties in life besides the care of the sick—a care which is surely part of the duties of the medical profession, who should be taught and trained to do so as part of their medical education. Were this done in civil life, then when the emergency arrives, as it has done now, would the civilian practitioner be fit to enter upon military duties and be granted the rank and pay which he would be entitled to. There is no school for either medical men or laymen at which hospital management is taught; the knowledge is acquired haphazard, mostly by making mistakes and by methods which can only be condemned offhand.

If our medical brethren in the Services do not find it derogatory to their profession or their *amour propre* to direct the internal economy of a hospital, the civil practitioner should surely be in a position to do the same; and were he trained as his military *confrères* are, he would occupy a different and better position than he does.

So it comes about that when the medical practitioner of experience and position offers his services at critical times for military work, he feels "insulted"

by being offered junior posts or refused altogether. It must be remembered he has only himself to blame. He has neglected to organize, to make hospital administration a part of his medical education, and thereby lessens his proficiency and is practically inadmissible to take the place of a trained specialist in time of war.

Abstracts.

THE RELATIVE THERAPEUTIC VALUE IN MALARIA OF THE CINCHONA ALKALOIDS—QUININE, CINCHONINE, QUINIDINE, CINCHONIDINE, AND QUINOIDINE, AND THE TWO DERIVATIVES—HYDRO-QUININE AND ETHYL-HYDRO-CUPREINE.

By Major A. C. MacGilchrist, I.M.S.

In the *Indian Journal of Medical Research* of July, 1915 (vol. iii, No. 1), the fifth communication of the Cinchona Derivatives Inquiry is published.

The methods adopted in this inquiry, the enormous amount of work accomplished, the wide range over which the inquiry extends, the completeness of detail, and the lucidity with which the whole is set forth, constitute a monument to Major MacGilchrist's acumen, industry, and scientific abilities. The importance of the Inquiry cannot be overestimated, and the completeness of information will take a permanent place in therapeutic and medical records. It is impossible to do more than print the chief conclusions arrived at.

The main object of this investigation was to determine the relative therapeutic value of the more important cinchona alkaloids and their derivatives.

The five alkaloids—quinine, quinidine, cinchonine, cinchonidine and quinoidine, and the two quinine derivatives, hydro-quinine and ethyl-hydro-cupreine (optochin)—were examined and their relative therapeutic value was determined in the following order, hydro-quinine being the most and quinoidine the least effective.

(1) Hydroquinine hydrochloride.

(2) Cinchonine sulphate, quinine sulphate, quinidine sulphate (for all practical purposes of equal value; if any difference, cinchonine is superior to quinine and quinidine is inferior).

(5) Optochin hydrochloride.

(6) Cinchonidine sulphate.

(7) Quinoidine.

Incidentally, in addition to determining the relative value of these alkaloids, many other important conclusions and suggestions were obtained.

Unpleasant By-effects.

As regards unpleasant by-effects of these alkaloids, buzzing in the ears was most frequently associated with quinine and quinidine; amblyopia, with quinine and cinchonine; diarrhœa, with cinchonine if administered for over a week; and nausea with quinoidine; cinchonidine, even in large doses, caused no unpleasantness of any kind.

Absence of Temperature.

About 4 per cent. of the patients who came to hospital for "fever," and actually had numerous asexual malarial parasites in their blood, had no rise of temperature above normal. These afebrile cases of malaria are usually benign tertian infections. When malignant tertian parasites are numerous enough to be found in blood, they are usually sufficient to cause fever: the toxin of the malignant tertian parasite is much more virulent than that of the benign tertian and, in the causation of fever, virulence of the toxin will counterbalance a considerable deficiency in quantity of infection.

Hyperpyrexia.

Hyperpyrexia is not peculiar to any special variety of malarial parasite, but it appears to occur most frequently in cases of malignant tertian infection. The irregular and remittent (as opposed to intermittent) temperature usually associated with malignant tertian infection is probably due to (1) the period of intermission being very short owing to the virulence and prolonged action of the toxin, and (2) the hours at which the temperature is registered.

The Arrest of Sporulation.

The first notable effect of these alkaloids is to arrest sporulation; sporulating forms are the first to disappear from the peripheral blood. Small rings and, somewhat later, half-grown parasites are the next to become rare and disappear. The last forms discoverable in the blood are full-grown schizonts and gametes.

The natural protective forces of a person in relatively good health greatly aid the anti-malarial action of these alkaloids.

Resistance of Parasite to these Alkaloids.

At certain stages of development the parasite is more resistant to these alkaloids than at other stages; and, to effect a complete disappearance of the parasite from the peripheral blood, the vulnerable stage in the cycle of development must be reached. It would appear that the minimal lethal doses for the vulnerable stage of the benign tertian, malignant tertian, and quartan parasites are, respectively, about 0·1, 0·15 and 0·2 grm. per 70 kilo. of patient's weight. The dosage being sufficient, the average number of hours required to cause a disappearance of parasites from the peripheral blood is roughly proportionate to the duration of the life-cycle of each parasite—the number of hours required in any individual case depending upon the period required for the parasite to reach a vulnerable stage in its developmental cycle.

Meaning of Disappearance of Fever.

The time that elapses between defervescence of fever and disappearance of asexual parasites from the peripheral blood is far from constant: it varies from practically *nil* in a few instances to three or even four days. Disappearance of fever simply means that sporulation is checked—the first obvious therapeutic effect of these alkaloids. When fever is checked, asexual parasites may still be quite numerous in the peripheral blood and may be quite unaffected in the spleen and bone-marrow. Herein lies the explanation of the frequently alleged futility of quinine treatment,, and the reason of the frequency of relapses, of the general prevalence of malaria, and of actual epidemics of this disease. Patients, as soon as fever disappears, regard themselves as "cured" and stop taking quinine, the result being (1) continuity of the infection in these patients, relapses, and consequently diminished vitality—which in its turn makes a real cure more difficult than ever, inasmuch as the natural protective forces of the patients are diminished, and (2) appearance of gametes and consequently the production of "carriers" and the spread of the disease.

The Dose of Quinine.

A curious but important fact discovered in this investigation is the smallness of the dose[1] of quinine which is able to free the peripheral blood of asexual parasites, and is possibly able to check the production of gametes. It is very rare indeed in practice to give such small doses to patients. The dose usually given being, therefore, generally sufficient, or more than sufficient, where we have failed hitherto is obviously in the *duration of treatment.* To a patient in whom gametes have developed it would appear that quinine should be administered daily for a period equal to the life-span of the individual gamete if there is to be any prospect of curing and disinfecting that patient. If malarial patients were really cured and disinfected, malaria would become a rare disease.

There is reason to believe that gametes are produced only when the asexual forms of the parasite are becoming exhausted or are exposed to inimical surroundings, as a last defence against total extermination.

Effect of the Alkaloids upon Crescents.

Ordinary doses of cinchona alkaloids have little influence upon crescents when once these are fully developed in the peripheral blood; but they apparently (1) check the production of crescents if administered before these bodies have appeared in the peripheral blood, and (2) greatly shorten the period during which these bodies, *having made their appearance during treatment*, can be found in the peripheral blood.

Artificial Products Unstable.

Parallelism or harmony between laboratory and hospital results is marked in the case of the five natural alkaloids—quinine, quinidine, cinchonine, cinchonidine and quinoidine; but is entirely wanting in the case of the two synthetic derivatives of quinine—hydroquinine and optochin, indicating that artificial products are more liable to show differences between *in vitro* and clinical results, as they are not so stable as the natural alkaloids.

Improvements in Manufacture Indicated.

Improvements in the manufacture of cinchona derivatives, for use in malaria, suggested by the results of this investigation are as follows:—

(1) To obtain a bark containing as little quinoidine as possible.

(2) To extract quinine for use as such and for the manufacture of hydroquinine.

(3) To issue the remaining alkaloids as residual alkaloid, which should contain as little quinoidine as possible but have a high percentage of quinine, cinchonine and quinidine combined.

[1] These minimal therapeutic doses are, of course, not to be recommended in clinical practice.

THE SERUM TREATMENT OF CEREBRO-SPINAL MENINGITIS.[1]

By G. A. Turner, M.B., D.P.H. and I. W. Brebner, M.B.

Diagnosis is of the greatest importance, and renders the prognosis of the case much more hopeful.

To diagnose a typical case of cerebro-spinal meningitis is not a difficult matter. If the patient walks into the hospital the disease may often be recognized at some distance off by the peculiar gait, for his body from the buttocks up appears to move slower than his legs, giving one the impression that he is going to throw himself backward, as a man does when swimming on his back. His condition is absolutely unmistakable. When put to bed it is found that his temperature is raised, there is stiffness of the neck, with probably a certain amount of retraction. Herpes may be commencing, or even well marked, on the lips or other parts; extensive patches at the back of the neck are noted. Kernig's sign is well marked, and there is appreciable tenderness when pressure is applied below the mastoid process. Finally, when lumbar puncture is done, the naked-eye appearance of the spinal fluid almost confirms the diagnosis, for it is usually opalescent, reminding one of the milk of a ripe coco-nut.

Microscopical examination of this fluid usually shows by smear preparation the presence of the intracellular diplococcus of Weichselbaum.

This is a brief description of a perfectly straightforward, typical case, but there are many grades of this disease. Occasionally a patient comes into hospital with a high temperature, marked headache, great tenderness of the limbs with severe rheumatic-like pains. Kernig's and other typical signs of

[1] Abstracted from the *Medical Journal of South Africa*, July, 1915.

cerebro-spinal meningitis are absent, and cannot be elicited even with the greatest patience. In all probability acute rheumatism is reluctantly diagnosed, and the patient continues very ill for four or five days, when quite suddenly cerebral signs become evident and the correct diagnosis of cerebro-spinal meningitis is made. Such cases are usually very severe ones. In others the symptoms come on suddenly, and we have seen a boy drop down in an epileptiform fit while waiting for his railway ticket, and some hours after recovering consciousness develop typical symptoms of cerebro-spinal meningitis from which he eventually died.[1]

On several occasions patients merely complained of slight headache overnight, not sufficiently ill to be admitted to hospital, but who were brought in unconscious first thing the following morning and were dead before nine o'clock.

To go to the other extreme, patients may come to hospital with a slight rise of temperature, some neck retraction, and evidence of Kernig's sign, in fact, typical cases of a mild form of the disease.

On lumbar puncture the spinal fluid is found to be under high pressure, jets out from the needle, but is as clear as distilled water, and the microscopical examination of the fluid is negative. Cases of this nature usually recover rapidly, the disease running its course in the matter of a few days.

The exact nature and pathology of this condition is a mystery, and they are not to be classified as cerebro-spinal meningitis.

In other cases the patient arrives in hospital with a high temperature, is irritable, possibly has herpes round the mouth, his breath sounds are not above suspicion of commencing pneumonia, and there is some uneasiness when one tests the neck for rigidity, and the patient winces on Kernig's sign being sought for.

It may be remarked here that, in eliciting Kernig's sign in coloured patients, the expression of the face is probably the most valuable indication as to whether the sign is negative or positive; but there is some doubt as to whether this uneasiness may not be the result of irritability, rather than a symptom of cerebral disease.

Such cases may remain on the border-line, so to speak, for several days before the symptoms become sufficiently definite to make a positive diagnosis and before one feels justified in making a spinal puncture to confirm that diagnosis.

Rash.—Cerebro-spinal meningitis is known in some countries as spotted fever, but we have only seen two cases with any rash, other than herpes, which could be associated with the disease. There may have been an eruption which has been obscured by the pigment of the Kaffir skin.

Vomiting.—This symptom, which appears to be so prominent in most epidemics, did not in any way attract our attention; it must be remembered in this connection that we are dealing with adult males only.

DIFFERENTIAL DIAGNOSIS.

(1) *Relapsing Fever.*—One patient was admitted to hospital with definite symptoms of commencing cerebro-spinal meningitis. He had to be carried to the hospital on a stretcher, had a high temperature, was drowsy; there was some stiffness of the neck muscles, and it was thought that there was evidence of Kernig's sign. On the morning following admission the symptoms had not progressed as would be expected had the case been one of cerebro-spinal meningitis; in fact, they had abated somewhat, and doubts arose as to whether we were dealing with a true case, and malaria was viewed with suspicion. On microscopical examination of the blood no malarial organisms were found, but the *Spirochæta duttoni* was very evident. This patient was a fresh arrival from the East Coast and must have been bitten by the *Ornithodoros moubata*[2] before leaving. In connection with the above it may be interesting to note that a native told us that when bitten by this particular tick you get very sick, and very hot, and the pain at the back of your neck is so bad that you cannot walk.

Relapsing fever accordingly should be kept in mind when considering cerebro-spinal meningitis in its early stages.

(2) *Rheumatic Fever.*—This disease has already been discussed when dealing with the question of the diagnosis.

(3) *Malaria.*—During the present year, the vagaries of this tropical curse have been brought most prominently before our notice, and on several occasions patients have been admitted to hospital within an hour or so of their arrival from the low country, in Portuguese territory. They have had a high temperature, were drowsy, had more or less indefinite symptoms, which led one to come to the conclusion that if the patient was not going to develop cerebro-spinal meningitis he would have pneumonia. This may appear a somewhat peculiar statement to make, only explained by saying that it is made as the result of a very extensive experience of both meningitis and pneumonia in native races, and that it is a line of thought forced on us after seeing many hundreds of cases of both diseases in the wards and on the *post-mortem* table. It has been found, however, that very frequently such cases have cleared up within twenty-four hours, on being given quinine.

Under these circumstances, although we have not examined the blood for the malarial parasite, we think that we are justified in adding malaria to the list of diseases to be considered in making a differential diagnosis.

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[1] "Rapidity of Onset." K. McGahey, JOURNAL OF TROPICAL MEDICINE AND HYGIENE, October 16, 1905, says, referring to an outbreak in N. Nigeria: "Two men went to draw water from a river 300 yards off; both became suddenly unconscious, and had to be carried back in a dying state."

[2] The *Ornithodoros moubata* has been quite well known, and generally feared, by the natives in many parts of South Africa for years past. Dr. Livingstone refers to it when describing his travels on the Zambesi. It has a variety of native names. Among the inhabitants on the East Coast south of Lat. 22° S. in Portuguese territory it is called Marota; the Dutch farmers in the Northern Transvaal have named it the Wandel louse.

(4) *Enteric Fever.*—The cerebral symptoms sometimes connected with this disease may at times be misleading, but difficulties in connection with it are more likely to be met with among European patients.

(5) *Pneumococcal Meningitis.*—Odd cases of this disease are always liable to occur during epidemics of cerebro-spinal meningitis; the differential diagnosis from a clinical point of view is impossible, for it must be remembered that pneumococcal meningitis may occur quite independently of any infection of the lungs.

The differentiation between pneumococcal and cerebro-spinal meningitis, even with spinal puncture and microscopical examination of smear preparation, is not in our opinion always such a simple matter as some people are inclined to make us believe. We think that the diagnosis of a case of pneumococcal meningitis during a cerebro-spinal meningitis epidemic is most frequently made after death. Needless to say, such cases are commonly missed in general practice, and as they do not respond to the use of Flexner's serum, it is possible that they do to a certain extent vitiate the results claimed by us and others for the intraspinal serum treatment. It may be here of interest to note that it is not an uncommon thing to find that patients who have died of pneumonia have, on *post-mortem* examination, quite large purulent exudates into the pia-arachnoid space, and yet have shown absolutely no clinical signs of cerebral trouble during life. It is possible that some people with cerebro-spinal meningitis may show no cerebral symptoms, and that a certain amount of cerebro-spinal meningitis may escape diagnosis for this reason.

(6) *Sunstroke.*—We merely mention this trouble. We have dealt exclusively with native patients, and though we have seen Kafirs collapse when standing in the sun, we have not had any difficulty in differentiating this condition from cerebro-spinal meningitis, but there may be occasionally some hesitation in making a differential diagnosis between the two conditions when dealing with a European population during an epidemic of cerebro-spinal meningitis in a hot country.

(7) *Syphilitic Gumma and Malignant Tumours of the Brain* should be borne in mind. On one occasion a cerebral gumma in a patient of the late Dr. Brodie caused much trouble; in fact, a correct diagnosis was not made until after death.

(8) *Scarlet Fever.*—In the "20th Century Practice of Medicine" is is stated, referring to scarlet fever:—

"Another variety is the one in which evidence of nervous trouble covers over all others, a condition like meningitis marking the period of invasion, so much so that Laveran considered cerebro-spinal meningitis as a form of scarlatina. This may continue for five or eight days; then the eruption appears, followed by desquamation. Death occurs with all the symptoms of meningitis, but *post-mortem* examination shows nothing more than circulatory disturbances in the meninges."

The above may be of interest to those doing European practice, but it is a peculiar fact that we have never diagnosed scarlet fever in a Kaffir.

(9) *Small-pox.*—Curschman says meningitis may resemble the initial stage of small-pox quite closely. Both diseases have intense headache, vertigo, delirium, coma, and convulsions. The most doubtful cases are those of meningitis of the convexity, extending over both hemispheres and without localizing symptoms. The rash of small-pox and the fever remission is wanting in meningitis. The difficulty of diagnosis is much increased in cases of epidemic cerebro-spinal meningitis in which erythematous and purpuric rashes may appear.

Treatment.

Serum Treatment.—The only treatment which we have found of any definite value in this country is the intraspinal injection of Flexner's serum. By the kindness of Professor Flexner, of the Rockefeller Institute, U.S.A., we were given, through the late Dr. Mitchell, Government Bacteriologist for the Transvaal, a considerable quantity of this serum. At a later date we were able to obtain supplies from the Department of Health, City of New York.

Professor Flexner gives the following instructions for the use of his serum:—

Directions for the Use of Flexner's Serum.

"(1) When the lumbar puncture is performed in a suspicious case, be prepared to inject the serum. If the cerebro-spinal fluid withdrawn is cloudy, make the injection of serum immediately and without waiting for a bacteriological examination. The next doses of the serum are to be given only if *Diplococcus intracellularis* has been demonstrated.

"(2) Always withdraw as much cerebro-spinal fluid as possible at each puncture and inject full doses of the serum. 30 c.c. of serum should be injected in every instance in which this quantity of fluid or less has been removed, unless a distinctly abnormal sense of resistance in the spinal canal is encountered after as much serum has been injected as fluid has been removed. When the amount of fluid withdrawn exceeds 30 c.c., introduce a large quantity of serum—up to 45 c.c. or even more. In the very severe or fulminating cases, inject from 30 to 45 c.c. of serum without reference to the quantity of fluid removed unless abnormal resistance is encountered.

"(3) In the very severe or fulminating cases, repeat the injection of serum within the first twenty-four hour period as soon as the symptoms intensify, or where the condition remains stationary after the lapse of the first twelve hours.

"(4) In cases of average severity, make daily injections of full doses for four days. If diplococci persist after the fourth dose, continue the injections until they have disappeared.

"(5) If the subjective symptoms, including fever and mental impairment, persist after the diplococci have disappeared, or after four doses have been given, the improvement is not progressing, wait four days, if the condition is stationary, and then repeat the four injections. Should the symptoms

have become worse before the expiration of this period, the injections should be resumed immediately.

"(6) In relapse, which is indicated either by appearance of the diplococci in the cerebro-spinal fluid or recrudescence of the symptoms, the four doses at twenty-four hour intervals are to be repeated and the subsequent treatment is to be conducted as for the original attack.

"(7) This plan of treatment is to be followed until the patient is free from symptoms, the diplococci disappear from the cerebro-spinal fluid, or the chronic stage of the disease supervenes. The serum has proven of some benefit in the chronic stages in which the diplococci are still present in the meninges. When the condition of hydrocephalus has been established the injection of serum into the spinal canal offers little of value. It is possible that direct intraventricular injections may be of benefit in this condition."

We have deviated somewhat from these instructions. We have not given injections as frequently as recommended, not on the score of expense, but because our patients were many and at first the supply of serum was limited; further, we found that patients often made uninterrupted recoveries after a single dose. We did not give a second injection until forty-eight hours after the first, and then only if the patient was not improving.

Our method of procedure was as follows: Our patient, or patients, as the case may be, were put to bed and their backs were rendered aseptic, that is, the skin over the lumbar region was rubbed with iodine, syringes were sterilized, &c., and a certain number of bottles of serum were placed in warm water ready for use. This is an important point: the injection of a cold serum has, we believe, been the cause of collapse in several of our cases when we first commenced this form of treatment.

The patient was laid on his right side, on a mackintosh sheet, with his legs drawn up and his back bent forwards as much as possible. The medical officer sat on the bed against the patient's buttocks, and protected himself with the sheet against involuntary fæcal evacuations. The operator passed his left arm under the patient's body, and took a firm hold of the edge of the bed on the same side on which he was sitting.

This leaves the medical man's right hand free to manipulate the needles, &c., and at the same time gives him a very firm hold of the patient, who, while in that position, has but little chance of twisting round suddenly and breaking the exploring needle into his back, an accident which we have known to occur.

The lines taken for puncture are as follows: Having got the patient into the position described, run the finger from the top of the crest of the ilium to the spinal column vertically downwards, and it will fall into the depression between the fourth and fifth lumbar vertebræ. Then push the needle from this point upwards and inwards towards the middle line.

In most cases one strikes the spinal canal at once, but this is not always so. At times, for some unaccountable reason, one cannot, even after the expenditure of much care and patience, hit the canal. On such occasions our advice is to get some other medical man to operate at once, and you will find that he will almost invariably get through on the first trial, which result is beneficial to the patient, and if the medical officer whose services you have requisitioned is a stranger to the treatment of cerebro-spinal meningitis, it will impart to him an air of superiority which is not justified.

After the needle is in the canal, care should be taken that the spinal fluid does not squirt out at such a high pressure as to sprinkle the attendants.[1] This may sound a somewhat far-fetched warning, but with native orderlies and many European ones we are certainly justified in bringing it forward. Such infected spinal fluid may be a real danger to those in the immediate environment, especially if it went into any person's eyes.

On many occasions, even when the needle is in the spinal canal, no fluid will come out, which may be due to several causes.

(*a*) The needle, in being pushed through the epidermis of the back, may have become choked by a plug of skin. This, it will be understood, is particularly liable to occur, should local anæsthesia in the form of freezing be used.

(*b*) The needle may be pushed so deep that it has impinged on the anterior surface of the spinal canal, for which reason the fluid cannot escape.

(*c*) The fluid in the canal may be so purulent and viscid that it will not run freely.

Our experience has been that once we are satisfied that the needle has entered, and the fluid does not flow, or merely shows itself at the end of the needle, in spite of the lumen of the needle being clear, the difficulty is often got over by telling the patient to cough, and so increasing the pressure of the spinal fluid.

In extreme cases we have fixed the syringe to the needle and exerted a certain amount of suction.

Robb says: "In some cases it was found that even when a large trocar was used, pus was obtained so thick that it would not be got to flow. In such cases a few syringefuls of normal saline were injected and allowed to flow off again, and this repeated several times, so that the lower part of the canal was fairly thoroughly washed out, and the serum was then injected" (*British Medical Journal*, October 31, 1908).

In our opinion, this would be a dangerous procedure. The increase of an already high intraspinal pressure might be suddenly fatal. At the same time, it must be recognized that with such a disease as cerebro-spinal meningitis the most heroic methods are justifiable.

Having started the fluid running, collect it carefully, and *above all be sure that you do not allow it* to come away too quickly; stop it altogether as soon

[1] Pressure of spinal fluid in cerebro-spinal meningitis may reach as high as 300 mm., the normal pressure being 120 mm. —OSLER.

as the pressure in any way tends to become negative. One does not want to see air sucked into the canal, an accident we have noticed to occur on several occasions. Having removed the spinal fluid, measure the quantity carefully and replace it with *warmed* serum; the quantity of serum to be injected depending on individual cases. If 60 c.c. of spinal fluid is removed, replace it very slowly with 40 c.c. of Flexner's serum, that is, with two bottles full.

It will be noted that our practice has deviated from Professor Flexner's instructions, in that we have not found it advisable to remove all the spinal fluid that will come away; 90 c.c. is, we believe, verging on the danger area for the first tapping. We have also differed from Currie and Macgregor in that we injected much more serum than they did.

J. R. Currie and A. S. M. Macgregor, dealing with 105 cases of cerebro-spinal meningitis treated with various forms of serum, not more than 25 c.c. of serum were injected at one time into the spinal canal. (*Lancet*, October 10, 1908.)

Though we have often injected much more than 25 c.c. we have frequently injected less than 20 c.c., when we have only been able to extract such small quantities as 15 c.c. of spinal fluid.

The reason why we so particularly emphasize the necessity of controlling the amount and rapidity with which the spinal fluid is removed is that on about twelve occasions[1] we have seen patients die within a couple of minutes of spinal puncture, the result probably, in our opinion, of too free evacuation of the spinal canal. The *post-mortem* appearance in such cases shows an extensive ecchymosis of the under surface of both lobes of the cerebellum.

The usual effect of this serum injection is that the patient, from being restless and wild-eyed, calms down and goes to sleep. This occurs almost immediately, and is one of the features of this form of treatment which appeals most markedly to anyone who has had to treat large numbers of cerebro-spinal meningitis cases before Flexner's serum was available.

In those pre-serum days one could hear the unfortunate patients shrieking in agony, and every case had to be carefully watched, for if this was not done he was liable to get from his bed, stagger about the room, and quite possibly fall up against the hot stove and make matters worse by burning himself. It will be noted that Professor Flexner's instructions are that an injection be made every day for the first four days, but interest of economy prevented us from doing this, as we had to husband our stock of serum carefully, for the patients came in rapidly, and we could not get further supplies of serum from America at that time.

Our practice was not to give a second dose until forty-eight hours after the first, and not even then, if the temperature had fallen and the general symptoms had abated.

[1] We have not full details of all the cases in which serum treatment was used. It must not be understood that of the cases quoted in this paper twelve died immediately after spinal puncture.

Quite apart from the ordinary text-book signs, such as temperature, pulse, and the degree of neck retraction, we have noted that the patient's eyes are a very useful indication as to his general progress. The patient who, even though his neck is retracted fairly extensively, yet follows you about with bright, clear, intelligent eyes is probably going to pull through, while the patient with apparently less severe symptoms, but with dull, listless, injected eyes, is not nearly such a promising case. On the third day of the disease, if there is no improvement, it has been our custom to make a second spinal puncture, remove more fluid, and give another injection of serum.

Dunn says in this connection: "I wish to point out that the persistence of such symptoms as retraction of the head, rigidity of the neck, and the Kernig sign, is not of great significance, while the subjective symptoms of pain, fever, and mental disturbances are significant, and call for renewed injection of the serum."

The second spinal puncture may be more difficult to perform, on account of a certain amount of œdema of the tissues, the result of the previous operation. In such cases we have often found it advantageous and easier to make the second spinal puncture a space higher up, that is, between the third and fourth lumbar vertebræ. When necessary—that is, if the symptoms have not abated—a third or more injection has been made.

It must be remembered that in some instances the effect of the serum is very rapid; for example, on one occasion we removed 90 c.c. of purulent fluid from the spinal canal of a Mozambique native and injected serum, and that boy's temperature was normal in three days, and at the end of a week he was complaining of a lipoma on his arm, a tumour which he must have had for years; showing that in such a short time he was able to look on the attack of cerebro-spinal meningitis as being of secondary importance to his chronic tumour.

Probably next to the serum, attention to the bladder is the most important point, for retention of urine is exceedingly common, and catheters have to be a prominent feature in the cerebro-spinal meningitis ward.

Possibly the bladder complications are unduly impressed on us, in consequence of the fact that a very large proportion of our patients were suffering from varying, but frequently advanced, degrees of bilharziosis of both bladder, rectum, and other organs.

Vaccine Treatment.—Dr. May, Medical Officer of Health for Northern Rhodesia, prepared an autogenous vaccine in pre-serum days from some of our patients. The effect of this vaccine was negative, as were those of vaccines bought from various firms at later dates. We have not at any time used a vaccine as a prophylactic.

Treatment by Drugs.—We tried various drugs in pre-serum days, but we need only mention three, viz., morphia, phenazone, and hexamine.

Morphia.—As regards morphia, we give it the prior and most important position, as we wish to

warn the profession against the temptation there often is to give a patient a hypodermic injection to relieve his pain. In our opinion this is a most dangerous practice, for we have had four or five patients die within fifteen to thirty minutes of receiving a quarter of a grain of morphia hypodermically.

Phenazone.—As regards phenazone, we believe the drug has a beneficial effect in relieving the painful symptoms of the disease, but since the advent of serum we have not required it. Before that time, however, it was a routine treatment.

Hexamine.—We have used this drug extensively, and at one time believed it had a beneficial effect. It was held that the drug was rapidly excreted into the spinal fluid and exerted a disinfecting effect there, but we doubt if our figures would show any reduction in mortality following its use. It may have had a beneficial effect, by its action on the urinary system, and ameliorated the bilharzial symptoms already described.

Surgical Treatment.—It was noticed that in the majority of the cases, on *post-mortem* examination, there was a thick yellow fibrinous purulent exudate confined mainly to the inferior surface of the cerebellum, pons, and medulla, and there being some doubt as to whether this exudate was not liquid during life, it occurred to us that possibly if the base of the skull were trephined, and the exudate allowed to drain, one ought to get beneficial results. We therefore trephined one patient. The result was that, owing to the high intracranial pressure, there was a considerable cerebral hernia, and the patient died at an earlier date than he would otherwise have done.

Nursing.—The first essential is strict attention to the bladder. Secondly, flies seem to be attracted towards a cerebro-spinal meningitis case, and this has led us to use mosquito nets extensively, not only to protect patients from irritation, but it is possible that the much-abused fly may be capable of conveying the disease from person to person.

Thirdly, the mouth of the patient is liable to become very foul. This condition is relieved by swabbing the lips and tongue with equal parts of glycerine and fresh lemon juice.

The intense headache may be relieved in some cases by shaving the head and applying cold packs; and the general discomfort of the patient is decreased by the sponging of the body; some people recommend hot baths.

Conjunctivitis and acute rhinitis frequently are a source of trouble, and quite possibly a danger to the attendants, requiring palliative treatment.

Complications and Sequelæ.

Pericarditis.—We found extensive and most acute pericarditis in about 5 per cent. of our *post-mortem* examinations. The condition must frequently be the determining factor in the cause of death.

Pulmonary Congestion.—It is usual to find both bases of the lungs acutely congested; in many cases the condition is verging on red hepatization. In some cases there is well-marked consolidation.

Blindness.—A certain number of patients recover from the cerebral symptoms but are found to be totally blind. These cases, in our experience, were few and far between, and that they all eventually recovered their full vision, after three or four months.[1]

Deafness.—Some patients became deaf after an attack of cerebro-spinal meningitis: it was not a common occurrence in our experience.

Paresis.—Partial or complete paralysis of the lower limbs has been noted on several occasions; these patients generally recover the use of their limbs, but were liable to be carried off by an attack of pneumonia.

Mental Deficiency.—We believe that some of our cases suffered from mental disturbances, but to what extent we are not prepared to state. To give an opinion as to the mental condition of the class of patient we were dealing with is an exceedingly difficult matter.

Only a limited quantity of Professor Flexner's serum was available, and after this had been exhausted the whole of South Africa was ransacked for stock antimeningococcic serum, with the result that small quantities of Allen and Hanbury's and Burroughs Welcome and Co.'s sera were obtained and used in the treatment of a certain number of cases. In regard to the results obtained with the two latter sera, the number treated was so small that no generalizations can be drawn from them, and we therefore intend to confine ourselves mainly to an analysis of the cases treated by means of Flexner's serum.

Of the series of sixty-five cases treated by means of Flexner's serum, pneumococci were discovered in the spinal fluid in five cases, all of which died. Of the remaining sixty cases, in eleven no meningococci were discovered on microscopical examination of the cerebro-spinal fluid, and although some of these cases were clinically typical cases of cerebrospinal meningitis yet a number might quite well have been due to a streptococcal or pneumococcal

[1] *Eyes in Cerebrospinal Meningitis*.—North describes dilatations, and in some cases contraction, of the pupils, redness and suffusion of the conjunctivæ, double or triple vision, and in a few cases there was total blindness. Wilson (*Dublin Quarterly Journal*, 1867) says the eyelids may be enormously swollen, and present the appearance of purulent ophthalmia or suppurative inflammation of the eyeball. He thinks this may result from lack of sensation of the eye. The anterior chamber often contains pus, and the choroid and iris are often affected. Blindness may occur as the result of binding of the lens with adhesions and infiltration of the iris, or of atrophy of the optic nerve. Dr. Edwin Jack says conjunctivitis was frequent. Desiccating keratitis was due to the imperfect closing of the eyelids and secondary necrosis of the cornea. Strabismus, caused by paralysis or irritation of the optic nerves by exudation at the base, was present in many cases. Geo. C. Merriman (*Monthly Encyclopædia of Pract. Med.*, Philadelphia, December, 1906): "It is a curious fact that often the patient will not only appear, but will be absolutely blind for a few days, this condition disappearing with the progression of convalescence and under proper treatment. Unfortunately the treatment is not always successful, and the blindness is permanent."

infection. Regarding these doubtful cases as cerebro-spinal meningitis, however, the series then shows sixty cases treated by means of Flexner's serum, with a mortality of 25, or a death-rate of 41 per cent., which is very encouraging.

Annotations.

The Spirochæte of Syphilis and its Cultivation.—Shapiro (*Russky Vrach*, No. 11) studied experimentally the modes of infection of rabbits with syphilis and the growth of spirochætes on horse serum. He comes to the conclusion that the spirochæte is a typical organism *sui generis*, the cause of syphilis, and not a transitional form of a plasmodium.

Neuritis of Workers in Rice Fields (Figueroa, *Revista de Medicina y Cirugia Practicas*, July 28).—Neuritis of the lower limbs is frequent in workers in rice fields when drainage is bad and the water stagnant with much decomposing organic matter. Rest and warm moist applications are beneficial, but change of occupation is necessary to prevent return. It is distinguished from beriberi by absence of œdema or atrophy, and from malaria by blood examination.

Chronic Thrombosis of Splenic and Portal Veins, simulating Banti's Disease (Lindbom, *Hygiea*, No. 13).—A woman, aged 56, gave a history of two healthy daughters; three other children had died in childhood. At 40 the spleen enlarged, and at 46 she began to vomit blood at times. After five years of this, Banti's disease was supposed to be responsible for the clinical picture, especially as ascites developed four years later requiring frequent tapping. The liver findings were normal, but the blood showed anæmia with low colour index and large numbers of nucleated reds, resembling the blood picture after splenectomy. The trouble proved to be the result of syphilitic changes in the vessel walls entailing thrombosis of the splenic vein. There is no doubt, Lindbom declares, that many cases have been diagnosed Banti's disease that were really of this type of chronic thrombosis of the splenic vein. The portal vein becoming involved likewise brings ascites in time. The special features which differentiate the condition from Banti's disease are the advanced age, the protracted, long stationary course, and the relative lymphopeny. Splenectomy is peculiarly risky in such cases and the effects uncertain, as the source of the trouble is not in the spleen but in the splenic and portal veins. The Wassermann reaction was constantly negative, but he suspected the syphilitic nature of the trouble from a perforation found in the septum, a history of optic neuritis twenty-one years before, ascribed to an assumed brain tumour at the time, and the fact that the temperature fluctuated under potassium iodide. An intercurrent erysipelas hastened the fatal outcome.

Review.

Diseases of the Nervous System. By H. Campbell Thomson, F.R.C.P. Pages 553 + xvii. Ten colour and twelve black-and-white plates, with 120 figures in the text. Second edition. London: Cassell and Co. 10s. 6d. net.

The book is divided into five sections. The first deals with the structure of the nervous system and other details connected with diagnosis, including lumbar puncture. Next are diseases of the peripheral nerves, followed by muscular dystrophies. The fourth section is devoted to diseases of the spinal cord. The fifth is concerned with syphilis of the nervous system, the distinctions between interstitial and parenchymatous syphilis are described with wonderful clearness, as are also general paralysis of the insane and locomotor ataxy; though throughout the book attention is directed to the various forms syphilitic manifestations may assume. The final section embraces diseases of the brain and diseases of general origin, including occupation neuroses, neurasthenia, hysteria, neuralgia, vasomotor neuroses, exophthalmic goitre, tetanus, and hydrophobia. From its size, the aptness and excellence of the illustrations, and by no means least the author's pleasant style, it is an unrivalled text-book for all who desire to acquire a comprehensive and accurate knowledge of one, if not the most, difficult special branches of medicine.

In a book that so nearly attains perfection one may notice the somewhat strange appearance of the decimal nomenclature, due to the new British Pharmacopœia, on page 305 and on the following page, the proprietary terms—anti-pyrine, febrin, and aspirin. An excellent index does not contain any allusion to ergotism and pellagra mentioned on page 233, nor leprosy.

The work meets every requirement for post-graduate and examination purposes; besides, it is pleasant and almost amusing; certainly the instantaneous photographs of various conditions and specimens of handwriting would grace any popular magazine.

Medical Notes.

Anthrax.—According to S. Kercelli (*Compt. rend. de la Soc. de Biol.*, vol. lxxvii, p. 263, 1914), Mollet finds that the bacilli of anthrax are killed in their passage through the alimentary canal of scavenger animals, such as foxes and ravens, but that spores survive. Kercelli states that dogs fed on anthrax-impregnated carcases remain infective to other animals for some time.

Gangosa.—A. Breinl (*Trop. Med. and Parasitol.*, vol. ix, No. 2), after investigating early cases of gangosa (Rhinopharyngitis mutilans) in New Guinea with a view of finding an etiological parasite, states that he finds in fluid from the swelling around the affected parts small bodies resembling yeasts belonging to the genus *Cryptococcus*, of the family Saccharomycetes, for which he proposes the name *Cryptococcus mutilans*.

Original Communication.

THE CAUSATION AND TREATMENT OF PELLAGRA.

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In the general interest evolved by the recent papers appearing on pellagra in the various medical journals of both continents, a short paper at this time may be of some value. Despite the various theories that have from time to time been advocated I desire to bring to the notice of the profession the following theory, viz.:—

(1) Gastro-intestinal auto-intoxication (or alimentary toxæmia).

(2) Actinic rays of the sun.

(1) Gastro-intestinal Auto-intoxication.

(1) The term gastro-intestinal auto-intoxication has been under discussion quite recently as not being a correct one to use, but being an old term and one more readily understood I am confident that its use will be permitted. In discussing this subject, and in order to go into the matter as fully as possible, I propose to deal with it under the following headings:—

(*a*) Relations of the gastro-intestinal tract to the skin.

(*b*) Relations of other organs to the skin.

(*c*) Relations of other conditions to the skin.

(*a*) *Gastro-intestinal.*

There seems to be abundant evidence in favour of this relationship. The conditions acne vulgaris and acne rosacea, which appear on the face, tell at once that the stomach is at fault.

The Intestines.—Taking typhoid fever as an example, we are all familiar with the fact that between the seventh and the ninth day there appear on the skin of the abdomen reddish or rose-coloured spots. Pathologically there is intense hyperæmia of the intestines during the first week. Sir Morris Malcolm, in a paper entitled "The Internal Secretions in Relation to Dermatology," published in the *British Medical Journal*, May 17, 1913, under the heading "Pigmentation," quotes Mr. Arbuthnot Lane as having described the pronounced pigmentation met with in cases of alimentary toxæmia beginning under the eyelids and thence spreading gradually over the face. The neck first becomes brown and then almost chocolate-coloured. The skin of the abdomen, the thighs, axillæ, and that covering the spinous processes of the vertebræ grows progressively darker, and on these surfaces areas of a still darker staining may develop.

Anatomy of the Sympathetic Nervous System.—We are well aware that the sympathetic nervous system is connected with the central nervous system by communicating and distributing fibres. The branches of communication between the ganglia are composed of grey and white fibres, the latter being continuous with those fibres of the spinal nerves which pass to the ganglia. The branches of connection between the ganglia and the central spinal nerves also consist of white and grey nerve-fibre, which may be contained in separate filaments or united in a single branch, the former proceeding from the spinal nerve to the ganglion, the latter passing from the ganglion to the spinal nerve, so that a double interchange takes place between the two systems (Gray). Dr. S. A. Kinnier Wilson, in an address published in the *British Medical Journal*, June 14, 1913, on "The Clinical Importance of the Sympathetic Nervous Systems," states that it possesses this remarkable feature: that it gives a double nerve supply to the skin and its appendages, the glands, vascular system, alimentary system from mouth to anus, and respiratory system, due to the two divisions of the system, namely, the sympathetic and para-sympathetic or autonomic. Traced into the cord we find that it is represented as the intermedio-lateral tract; farther up to the brain it can be traced farther backwards than the basal ganglia. There is another important point in connection with the sympathetic nervous system, and that is the chromaffine cells which are found in the sympathetic ganglia and plexuses, also masses of chromaphile tissue lying in depressions on the dorsal portions of the ganglia. In the chromaphile system, therefore, we have a widespread tissue immediately allied to the sympathetic nervous system in origin and localization endowed with important physiological properties, &c. Chromaphile tissue secretes a substance which has a definite and characteristic action on non-striped muscle fibres, in other words, on structures which are innervated by the sympathetic nervous system.

The intestines are entirely supplied by the sympathetic nervous system through the superior and inferior mesenteric plexuses, these finally subdividing into Meissner's and Auerbach's plexuses respectively, supplying the muscularis mucosæ which are composed of non-striped muscle fibres.

Pathology.—Dr. Mott, of London, in his histological changes of the nervous system in Dr. Box's case of pellagra, among other things states that the combined sclerosis is not unlike that found in a pernicious anæmia, which we know may be due to streptococcal toxæmia, &c. Moreover, my experience tells me that the nerve cell changes rather indicate a chronic toxæmia.

Dr. H. F. Harris, of Atalanta, Georgia, in a paper on "The Pathology of Pellagra," which appeared in the *Transactions of the First National Conference on Pellagra*, held in South Carolina, in discussing the pathology of the brain, says: "By far the most interesting communication that up to that time had been made on the changes in the brain was an article by Babes and Sion in 1899. They showed the presence in the nerve cells, particularly in the large chromophilic cells in the cortex, of unmistakable degenerative changes. . . . The nuclei are frequently pushed to one side and lose their power of taking basic stains, and present swollen nuclei; the pigment in these cells is also dislocated, and instead of being around the nucleus lies scattered throughout the cell body. . . ."

These alterations have been in the main con-

firmed by Marinesco, Rossi, Richette, Grimaldi, and by myself in this country, and are of great interest and importance.

Spinal and Sympathetic Ganglia.—The ganglion cells of these structures exhibit changes similar to those found in the central nervous system, though they are not, as a rule, so marked.

In the "Report of the Illinois Pellagra Commission" the following occurs:—

"*Case No.* 2.—Nervous system:—Nerve cells: Widespread chromatolysis of axonal type with marked pigmentary changes are found involving especially the larger elements. Pigmentary changes are present even in the medium-size pyramidal cells, &c. Many of the cells, especially among the smaller elements, show a diffuse dark stain, which with a heaping-up of satellite cells suggest the existence of a more chronic type of cell change. Similar changes are present in the Purkinje cells and the cells of the posterior root and sympathetic ganglia."

The Absorption of Toxin or Toxins from the Gastro-intestinal Tract as a Causative Factor in Pellagra.—In the "First Progress Report of the Thompson-McFadden Pellagra Commission," Dr. W. J. McNeil, in his observation on the intestinal bacteria in pellagra, states that "in general it was ascertained that the fæcal bacteria in pellagra, when examined directly with the microscope, are different from the normal in their quantitative relationship, and that unusual kinds of bacteria, more or less heterogeneous in nature, are present." In the summary of the same report by various authors, under the heading "Symptomatology," the following statement is made: "It would appear that three or four years ago a large proportion of cases observed in the county presented intestinal and nervous symptoms of great severity. In 1912, in many instances symptoms were quite mild and sometimes were confined almost exclusively to the cutaneous system, the disease appearing to be of less virulent type in 1912 than in previous years; also the fæces contain decidedly abnormal amounts of indol and skatol, especially the latter. Again, the fæces of pellagrous individuals have most characteristic aromatic odour, and the estimation of the indol and skatol would indicate that this odour was due to the large amounts of these aromatic bodies found to be present. Normally, only traces of these bodies are present, and from the investigation of Herter and also of one of us (Myers), with Fisher and Diefendorf, the amounts detected, especially of skatol, may be regarded as decidedly abnormal and indicative of peculiar bacterial conditions in the intestine. When these results are compared with the acidity determinations in the gastric juice, some relation between the amount of skatol formation and anacidity is apparent."

Dr. J. A. B. Hammond, of the Isle of Wight, in reporting a case in the *British Medical Journal* of July 5, 1913, states that "when I first saw the patient the general impression was that of one suffering from chronic toxæmia, probably of intestinal origin."

In the *post-mortem* report we find confirmative evidence. In Dr. Mott's report of the Egyptian case related in the *British Medical Journal*, it is stated that "the stomach dilated and thinned, with denudation of epithelium. The small intestines normal in condition. Large intestines in condition of chronic colitis, with denudation of the epithelium and patches of marked congestion with ecchymoses and arborization of blood-vessels."

It would seem quite possible that whatever may be the toxin or toxins in the gastro-intestinal tract that may be the primary cause of pellagra, it is evident that these toxins act on the sympathetic nervous system in the intestines, then on the chromaffine cells and tissue, which by their close connection with the central nervous system produces the pigmentation called pellagra, with its resulting degeneration and neuritis.

(*b*) *Relation of other Organs to the Skin.*

The Lungs.—In pneumonia we have herpes labialis; in phthisis we have yellowish spots appearing in the region of the sternum—pityriasis versicolor.

The Suprarenals.—The pigmentation in Addison's disease is an exaggeration of the normal, and occurs, therefore, in the face, the neck, the hands, anterior folds of axillæ, nipples, perineum, and genitals, while in more advanced cases the mucous membrane may become pigmented (Rolleston).

Pathological Changes in the Glands.—(1) Atrophy of one or both glands. (2) The various stages of tubercular degeneration: (1) interstitial growth; (2) fatty degenerated patches; (3) caseous masses.

The semilunar ganglia are degenerated and much pigmented, and they may, through cicatricial contractions, become entangled as it were in the diseased tissue of the adrenals. The nerve fibres show extensive sclerotic changes. Drs. Alexis and Arnaud assert that "Addison's disease will not result if the pericapsular ganglia be not affected, though the other portions of the adrenal bodies are at the same time extensively diseased" (Wheeler and Jack).

The Pituitary Gland.—There is pigmentation in this condition. Sir Malcolm Morris quotes Harvey Cushing as saying that in all his patients affected with primary hypo-pituitarism, except the older ones, the skin was smooth, transparent, and notably free from moisture (*British Medical Journal*, May 17, 1913).

The Thyroid Gland.—One of the signs of myxœdema is the yellowish tint which the skin presents. Red patches may mark the skin over the nose and on the cheek. In exophthalmic goitre the skin may show a pigmentation closely simulating that of Addison's disease and leucoderma, severe pruritus or urticaria. It may be well to note in passing that the suprarenals are supplied exclusively by the solar plexus, also that the thyroid gland is supplied entirely from the superior and middle cervical ganglia of the sympathetic nervous system.

(*c*) *The Relations of other Conditions to the Skin.*

The familiar pigmentary signs of pregnancy suggest that the sexual secretions may be concerned

in normal coloration. The malignant cachexias of the various organs and the various anæmias all seem to suggest that the skin is an index, not only to the gastro-intestinal tract, but also to other organs and different blood states.

(2) The Actinic Rays of the Sun.

In the study of spectrum analysis there is what is known as the reverse dark line or absorption spectrum. Light transmitted through certain liquids, as blood, produces band spectra; these spectra are obtained only when light passes through media capable of absorbing rays of a certain wave length, hence they are called absorption spectra. The sun also consists of a luminous solid, a liquid of intensely heated and greatly condensed gas called photosphere. From the above it would appear that there are factors in the sun's rays which can act as an irritant to the uncovered areas of the skin, and so cause an intense hyperæmia to the subject whose vitality is already lowered from defective nerve innervation.

Turning to the clinical side of pellagra, we seem to find abundant evidence of the condition occurring in the spring and summer time, even in the colder countries. In the case described by Dr. Hammond he states that "in the late spring of 1912 she (the patient) was taken out into the garden and for two or three days somewhat exposed to the sun; this was quickly followed by the appearance of an erythematous dermatitis over the back of the hands and wrist. The palms escaped, but on the wrists it crept round to the front, as described by Dr. Charles Box; a little later it came on the cheeks and on the lips. At first we regarded it as a severe sunburn, but soon bullæ appeared and there was considerable suppuration, especially from the lips and between the fingers. A little later the tongue and mouth ulcerated."

Dr. Sambon, in commenting on Dr. Kay's case at Lymington, states that "when one considers all the foregoing points, the appearance of the first eruption at the end of summer, its second appearance at the beginning of spring, and its third recurrence also in spring, the remission of symptoms and improvement during winter, the bilaterally symmetrical erythema with subsequent desquamation, the vertigo, tremor, &c., one cannot help coming to the conclusion that the case is one of pellagra." Dr. Stephenson's case at Prestwich: "At the end of May the skin on the dorsal surfaces of the hand and wrist got red, rough and scaly; the face was also involved, but to a lesser degree—the bridge of the nose and both malar regions. The conditions were at first thought to be severe sunburn, for some other patients were undoubtedly sunburnt at the same time, but whilst all the others got better, this case did not. . . . On July 13 the patient was exposed to bright sunlight, the hands were markedly reddened again. During July 16 and 17 she was kept in bed in a subdued light. On the 18th the fading colour was noticeable. After being out again on the 19th and 20th her face and one hand had got a vivid red, and she indicated that the skin felt sore. The other hand had been covered with a glove, and it remained pale, the rash on her face being brighter than before."

Dr. Box, of St. Thomas's Hospital, in reporting a case in the *British Medical Journal*, August, 1914, makes the following statement: "The month was December and the typical eruption was not present. . . . I had an opportunity of seeing the child in May this year; the rash had made its fourth appearance and was very striking; diffuse dermatitis implicated the flush area of the face, tip of nose, and margins of the mouth; the dorsal aspects of the hands and lower third of forearm showed the pellagrous gauntlet. . . . She was described by the house physician as looking very well and sunburnt, the skin of the affected parts being characterized as 'tanned.'"

Dr. W. H. Harris, of Tulane University, New Orleans, an excerpt from whose report appeared in a leading article in the *British Medical Journal*, July 5, 1913, referring to his experiments carried out on monkeys, observes: "Monkey No. 2 was inoculated on December 2, 1912; it remained apparently normal for a period of about two months, and on February 12, 1913, it was again inoculated with filtrates from another typical case of pellagra. Early in May it showed irregular patches of a copper turkey-red colour about the face. On May 10 these patches were raised, considerably darkened, very dry, and more clearly defined; they extended across the nose and spread in wing-like manner on either side under the eye and over the cheek. . . . On May 28 the skin lesions had become almost black and were beginning to scale."

Treatment.

The gastro-intestinal tract ought to be thoroughly disinfected, and with this aim in view the undermentioned drugs have been found serviceable:—

Internally.—Calomel, beta-napthol, acetozone, thyroid tablets.

Externally.—An ointment consisting of beta-naphthol, balsam of Peru, and zinc ointment; later, when bullæ have burst and a raw surface has been left, tar, salicylic acid, ammoniated mercury and zinc ointment can be applied.

Diet.—Ripe bananas daily; the avoidance of salted fish.

General.—Keeping in the shade as much as possible.

Conclusions.

(1) That pellagra is a disease akin to Addison's disease.

(2) That the causal bacteria is in the intestines, as indicated by the amounts of indol and skatol present, and that it primarily affects the sympathetic nervous system and secondarily the central nervous system.

(3) That there are factors in the actinic rays of the sun which can act as irritants to the exposed surface of the skin so as to intensify the condition.

(4) That it responds to treatment by gastro-intestinal antiseptics internally, and externally by the usual protective ointments.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 15, 1915.

THE INTERMEDIATE HOST IN BILHARZIA.

How bilharzia is conveyed to man has caused much discussion for some years. Recently our knowledge has been advanced a step, and it even seems as though at last the problem has been solved by recent work in Egypt. Hitherto the scientific world had listened to the teaching of Looss, and any attempt at upsetting the classical research of that great authority was considered to be well-nigh sacrosanct. But we are getting accustomed to the tenets of our belief being shaken of late years and to recast the very foundations of our knowledge. The early belief that bilharzia infection could take place by way of the skin was itself a subject of contention; and although this is still accepted, it is not in the direct way that Looss believed he had proved. His conclusion that the parasite is communicable directly by water only from man to man was a refutation of an earlier belief that the bilharzia worm, like other trematodes, required to undergo a metamorphosis in a molluscan intermediary before it was capable of infecting another person. It may be said that it is the establishment of this earlier belief that Lieutenant-Colonel Robert T. Leiper, D.Sc., M.B., has proved to be true. Several flaws in Looss's conclusions were found by Colonel Leiper during his investigation of trematode infections in Hong Kong and Japan in 1914, and it was in consequence of information then gathered that he was sent to Egypt in 1915 "to investigate bilharzia disease in that country and advise as to the preventive measures to be adopted in connection with the troops." Drs. R. P. Cockin and I. G. Thomson were associated with Colonel Leiper in the inquiry, and W. MacDonald acted as laboratory assistant. In his report Colonel Leiper gives an interesting account of the history of bilharzial disease in ancient and modern Egypt, and then proceeds to relate the several theories held and the various experiments made up to the year 1915, when he started his own investigations. Looss had, owing to repeated failures to obtain experimental verification that the parasite of bilharzial disease gained access to the bodies of other animals, come to the conclusion that man is the only host of *Bilharzia hæmatobia*. Anyone reading Looss's papers on the subject could hardly fail to be convinced that the views he held were correct, yet there were chinks in the armour of his attack and defence, and it was to probe the defects in his arguments that Leiper went to Egypt. Starting with the presumption that there is an intermediary host in which the bilharzia disease germ passes part of its existence, he directed his attention to the fresh-water molluscs, crustaceans, &c., met with in districts where the disease exists in man.

The programme of work laid down and consistently followed was:—

(*a*) To collect and specifically determine all the fresh-water molluscs in the selected endemic area, *i.e.*, within half a day's journey from the laboratory in Cairo.

(*b*) To dissect large numbers of all species found for trematode larvæ.

(*c*) To differentiate among the larvæ found those showing the morphological characters peculiar to the bilharzia group.

(*d*) To ascertain which, if any, species of mollusc showed chemiotactic attraction for bilharzia miracidia.

(*e*) To induce experimentally infection of animals brought from England with *B. cercaria* when found in the mollusc.

(*f*) To ascertain experimentally whether infection took place through the skin or by the mouth or in both ways.

(*g*) To ascertain experimentally the incubation period of the disease.

(*h*) To determine experimentally on infected animals the efficacy of medicines, reputed to be of value on clinical grounds, to destroy the bilharzia worms in the portal system.

(*i*) To observe the conditions favourable and inimical to the life of the free-swimming cercaria and the effect thereon of acid solutions and other medicinal substances.

(*j*) To study the bionomics of the special molluscan intermediary, if obtained, for facts upon which prophylactic measures could be formulated.

Although Looss, as the result of his investigation, came to the conclusion that none of the Egyptian mollusca exhibited the slightest attraction for the freshly hatched miracidia of bilharzia, Leiper found that a definite attraction was exhibited by the following: *Planorbis boissyi*, *Bullinus sp.* (?), *Pyrgophysa forskali*, and *Limnæa truncatula*. The attraction was stronger in young specimens. The plurality of susceptible forms appeared to indicate the possibility of a plurality of intermediate hosts or the susceptibility of the *Bilharzia hæmatobia* miracidia to the intermediate hosts of other species of bilharzia, or merely, as seemed probable in *Limnæa truncatula*, to a peculiar adhesiveness of the mucus covering the exposed portion of the molluscan body.

Three cercariæ of bilharzial type were found in four different species of molluscs. There are three species of bilharzia worm met with in Egypt: In man the *Schistosoma hæmatobium* (both varieties), in cattle the *S. bovis*, and in ducks the *Bilharziella polonica*.

It is also interesting to note that although rats were proved experimentally to be susceptible to bilharzial infection, in one of the most highly infected districts, that of Marg, near Cairo, no rats were met with. Leiper sagely suggests that it was possible that this extraordinary absence of rodents might be due to their susceptibility to bilharzia disease leading to their extermination.

Of the animals inhabiting bilharzial districts, man and cattle were the obvious sources of contamination of the canal water, and as each was a known host of species of bilharzia the probability that cercaria normally developed in them is obviously great. Many other animals were proved susceptible to the disease in question, and the Mission brought back from Egypt four mice, twenty-six white rats, sixteen desert rats, two guinea-pigs, and four mangaby monkeys, which had been submitted to infection shortly before departure. When examined shortly after their arrival in England all these animals had enormous numbers of bilharzia worms in the portal system.

It is impossible to deal at greater length in the space at our disposal with this interesting subject, or with the complete and masterly manner in which it has been carried through by Colonel Leiper and the other members of the Mission above mentioned. Looss's conclusions seem to be entirely set aside by these recent investigations, and although we wait with interest to see what can be said on the other side, the arguments advanced are so positive in their claims, whereas Looss's were based on mostly negative findings, that it is difficult to see where the flaw, if there is any, can be found.

To understand the divergence of conclusions between the result of the work by Looss and those put forward by the recent Mission, it is necessary to understand what was the position taken up by Looss. He states (*Ann. Trop. Med.*, 1908): "If this conclusion (infection by miracidia) is correct, it leads to the important consequence that the spread of the *Schistosomum hæmatobium* is not limited by the natural geographical distribution of a special intermediary host. It can spread wherever man carries it, so long as, and in so far as, the climatic and hygrographic conditions are favourable for its development." "The Egyptian peasants usually work their fields in companies; sometimes of two or three, sometimes of several dozens, standing with their feet, and working with their hands, in the water or the mud. They often also bathe in companies in canals with slowly flowing water, pools, &c. One of them who is infected with urinary bilharziosis, when urinating into the water, infects it with several hundreds, perhaps thousands, of eggs. In warm weather the miracidia hatch within a few minutes. They have at once the opportunity of finding a new shelter, either in the skin of the man who voided the eggs or in the legs and hands of one of his comrades working close by him. . . . These possibilities of infection are repeated every time a man urinates into the water. They are perhaps repeated every day the season of the Nile flood lasts."

Again, Looss writes in the *British Medical Journal*, 1909: "When once free from their eggs' shells they (the miracidia) disperse in the water to all sides, and the chance of reaching a suitable shelter considerably decreases for the individual miracidium with time and distance. The more I think of this latter circumstance the more I become convinced that the chief foci of infection—that is, the places where strong and repeated infections are contracted—cannot be found in large bodies in waters, as rivers, canals, ponds, &c., but must be sought in small accumulations of water, in which the miracidia, once introduced, cannot become widely dispersed."

"To render an infection of the skin at all possible . . . the following conditions must be realized: An infected person must urinate (or defæcate) in a place where there is water, however small the quantity. The place must remain moist for some time, but not longer than thirty to forty hours. Within this period another person must bring some part of his skin for some time into actual contact with the moisture. If these conditions are fulfilled the miracidia have the *possibility* of getting from man to water and from water back to man; their life-cycle may be closed.

"The infective power of moist places *gradually decreases* and is *again nil* at the end of one or two days, even if they remain moist. A recent contamination must take place in order to render them infective again for a short period."

"The moist places demanded for infection are to be found plentiful about towns: in the streets there remain puddles for several days after each rain or for several hours after each watering; the courtyards of the houses also are often watered, especially in the warm season. In many Arabic houses water-closets are an unknown institution or they are of the most primitive type. The calls of Nature are often obeyed in the streets, oftener in the courtyards, especially for urinating. There is thus sufficient occasion for the ground to become over and over again populated with live miracidia: their short life is of no consequence. There only remains the host to supply the miracidia and another to take them up again."

"Contaminated water loses its infective power again after having been protected from fresh contamination for one or two days."

In 1910 Looss states: "Taking the (miracidium) infection by the way of the skin as an established fact, the measures to adopt for preventing it are clearly given. First of all, infected persons should never evacuate urine or fæces into water, for this is the only way in which the latter becomes populated with the dangerous germs. If any body of water can be shown to be safe from contamination, it must, as a matter of course, be left out of consideration as a source of infection. If water is likely to be, or is likely to have been, contaminated, it should not be used for bathing, washing, or working in before about two days have passed. But even here a certain reasonable discrimination should be made. For in a large body of (standing or flowing) water, *e.g.*, the Nile, any germs are soon so much dispersed that the possibility of picking up one or another becomes very small and may be increased only by a very prolonged contact with the water. Dangerous in the first place are small bodies of standing water, both permanent and transitory, because in these the germs cannot disperse."

Conclusions Contrasted.

Conclusions based on the Looss Hypothesis.

(1) All transient collections of water, such as those resulting from occasional showers of rain, road waterings and domestic waste, are dangerous if freshly contaminated.

(2) Large bodies of water, such as the Nile, canals, marshes, and birkets, are little liable to be infective.

(3) All water in a given area would automatically become safe in thirty hours if the native infected population were removed.

(4) Infected troops would be liable to reinfect themselves, to spread the disease among other troops, and to convey the disease to any part of the world.

(5) Infection only takes place through the skin.

(6) Infection in towns is due to contact with recently contaminated moist earth or water.

(7) Eradication depends upon education and complete sanitary control throughout the country. The sustained co-operation of the affected individual is essential.

Conclusions based on the Results of the Present Inquiry.

(1) Transient collections of water are quite safe after recent contamination.

(2) All permanent collections of water, such as the Nile, canals, marshes, and birkets, are potentially dangerous, depending upon the presence of the essential intermediary host.

(3) The removal of infected persons from a given area would have no effect, at least for some months, in reducing the liability to infection, as the intermediate hosts discharge infective agents for a prolonged period.

(4) Infected troops cannot reinfect themselves or spread the disease directly to others. They could only convey the disease to those parts of the world where a local mollusc could efficiently act as carrier.

(5) Infection actually takes place both by the mouth and through the skin. Recently contaminated moist earth or water is not infective.

(6) Infection in towns is acquired from unfiltered water which is still supplied, even in Cairo, in addition to filtered water, and is delivered by a separate system of pipes.

(7) Eradication can be effected without the cooperation of infected individuals by destroying the molluscan intermediaries.

The report of the Mission is published in the *Journal of the Royal Army Medical Corps* for July, 1915, and is to be continued.

ANTI-MALARIA WORK IN ITALY.

The railroads in Italy are the property of and managed by the State, and employees in the regions infected with malaria always suffered severely from the disease. During the years 1885 to 1901, on an average each year, 69·92 per cent. of the railroad employees in the malarial districts contracted the disease. In 1906 a vigorous screening campaign was inaugurated and the proportion dropped to 24·65 per cent. This number has been constantly growing less since, until during 1914 only 6·03 per cent. of the employees living in the hotbeds of malaria or working there had malaria, and they lost only an average of 1·01 days from work.

TYPHUS CHECKED.

The American Minister at Bucharest, Roumania, in a cablegram dated July 26, says that he visited 75 per cent. of all the Serbian hospitals, and found no new cases of typhus. The malady appears to be entirely checked, but the physicians say that it may appear again later.

Annotations.

Tick Fever.—Representatives of the State Board of Health left Portland on August 19 for the Warm Springs Indian Reservation, where several cases of Rocky Mountain spotted fever have been reported. During the last year there were forty-six cases of tick fever in Oregon with six deaths.

The Heart in War Typhoid.—Rohmer (*Deutsch. med. Wochenschr.*, July 22) has treated twenty-two cases of typhoid in men whose hearts were already suffering from the stress of the campaign. In a previous series of fifteen fatal cases all but three of the men died from heart weakness, but in this later series heart stimulants were given freely, especially intravenous injections of strophanthin, and all the patients recovered except one who succumbed to intestinal hæmorrhage when apparently convalescing. The hearts are even yet not entirely normal.

Bed-bugs and Relapsing Fever.—Stephansky (*Russky Vrach*, No. 10) infected old and young generations of bed-bugs with blood from patients with relapsing fever, and examined them later for the presence of spirochætes. An hour after infection the spirochætes had lost their motility, and they had disappeared altogether after four or five hours. In another series of experiments ten grown bed-bugs infected with relapsing fever blood were killed and an emulsion made of them in normal salt solution. This was injected subcutaneously into monkeys, with negative results. Sixty-five infected bed-bugs and their young were fed once a week on the blood of a perfectly healthy man who during two months was bitten by them at least 500 times, and remained unaffected. It is evident, therefore that bed-bugs have no share in the spread of relapsing fever.

The War and Infectious Diseases in Germany.—The appearance of several cases of cholera among soldiers returning home from the front and several civilians in the Oder district has led the authorities to increase their efforts at prevention of the spread of this disease. Every known measure is being resorted to, especially in regard to water sanitation, and the steps previously taken in the Weichsel district, which proved so successful, are now being duplicated in the East. Therefore it is expected that cholera will not assume any alarming proportions. Similar precautions are being taken with reference to other infectious diseases and the results thus far have been good, although several cases of typhus, dysentery, meningitis, and typhoid have occurred both in the East and in the West, but nowhere is there any danger of an epidemic. Cases of these diseases are, in fact, restricted almost entirely to the soldiers.

Typhoid and Small-pox in Greensboro, North Carolina.—During June twenty-four cases of typhoid fever were reported in Greensboro, twenty-three of which were in white persons. There were also reported eleven cases of small-pox for the month. The general vaccination now being carried out against both diseases gives confidence to the belief that both are well under control.

The Typhoid Epidemic on Hart's Island, New York.—The number of cases of typhoid fever reached eighty during August, and there have been five deaths. The source of the epidemic has not been definitely settled, but there is a theory gaining some credence that these epidemics which have been occurring annually may be traced to Potter's Field, which is located on this island, and where over 200,000 unclaimed bodies have been buried.

Acute Appendicitis in Typhoid.—H. Gage reports (*Annals of Surgery*, August) an instance of an acute gangrenous appendicitis, occurring at the beginning of a convalescence from an attack of typhoid. He believes that its presence in the exudate and in the walls of the appendix would seem to indicate that the bacillus of typhoid was taking at least an active part in the process, confirmed by the presence of a typical typhoid ulcer. Twice within eight days the leucocyte count had been 7,000 and 8,000, and within a few hours after the onset of the pain it rose to 14,000, and then to 15,000, and in eight hours to 18,000.

New Bacteriologic Differentiation of Typhoid.—Gautier (*Revue med. de la Suisse romande*, July) has tested the sand technique devised by Carnot and Hallé. A pipette tube 33 cm. long by 5 or 6 mm. in diameter is softened in the centre and the ends brought up parallel, to form a U. One of the arms is filled to a height of 10 cm. with very fine sand (passed through a No. 40 sieve). The other arm is then filled with hot bouillon tinted with neutral red, which works up through the sand until the fluid is at the same level in each arm. The arm in which there is no sand is inoculated with a few drops of fluid with which the intestine has been rinsed out after a preliminary enema, and the tube is incubated for eighteen hours. The bacteria that are most motile will penetrate the sand and develop in this arm of the tube. Gautier's experience with thirty cases confirms the assertions of Carnot and Hallé, but he found that, occasionally, colon bacilli were sufficiently motile to pass through the sand. Consequently it may be necessary to apply the agglutination test afterwards to determine finally the presence of typhoid bacilli. He found that the sand barrier infallibly excluded all but extremely motile bacteria, and thus much facilitated and accelerated differentiation.

Abstracts.

THE RECENT DECLINE OF ENTERICA AMONGST BRITISH TROOPS IN INDIA.[1]

THE EXCREMENT OF FLIES THE MOST IMPORTANT FACTOR IN THE SPREAD OF ENTERIC.

By Lieut.-Col. N. FAICHNIE, R.A.M.C.

NONE of the text-book causes of enterica quite account for the disease in India, but it would seem that the fly may become a true typhoid carrier, and has been the most important cause of the disease. I could not see how milk, or dust, or flies, or direct infection from carriers, could account for enterica in India. Although the incidence was not at all like that at the beginning of a water outbreak, illnesses resembled in many points the so-called secondary cases, when the pollution is more diluted, so that I confidently expected to find in water a solution of the problem. My experience of English camps had been that with a pure water supply only one outbreak had occurred in three years, while at that time, it may be mentioned, although water was frequently said to be pure, the precaution of boiling it was taken at all stations in India. At the same time, I knew that if I found a station with a high average enteric rate and a pure water supply I should have to look for another cause, and, curiously enough, my first station, Campbellpore, was one where the combination existed. The average rate for enterica was 32 per 1,000, yet the water contained no *B. coli*, while it gave a very good chemical analysis. The general sanitation of the barracks was very good indeed. The trenching grounds were within a few hundred yards of barracks, and although flies were present there, I could not see how they could do any harm, as the place seemed absolutely clean, and all night-soil was quickly covered up, while antiseptics were so freely used in the latrines that no fly ever went there. As I could find no other satisfactory cause, the matter remained a mystery to me. My headquarter station, Mhow, presented very interesting details, as for twenty years before 1908 the enteric rate had been 33 per 1,000. In that year, at the end of which I arrived, it dropped to 4 per 1,000, and even this low rate gradually diminished during the next five years. Something, therefore, must have happened between 1907 and 1908 to account for so startling a change. The only important sanitary reform different from other stations I could discover was in connection with the trenching grounds, which were in excellent condition when I arrived and not a fly was to be seen anywhere. In 1907, however, they had swarmed with flies, the year when the system of trenching had been revised. I had better say here that trenching grounds may swarm with flies for two reasons. First, if the night-soil is deposited carelessly and not completely covered up, all the flies in the neighbourhood are attracted and are likely to feed and breed there. But even if the night-soil is covered carefully and the ground spotlessly clean, flies may be present, as eggs may have been laid in batches of 100 at a time either in the latrine pans or in the storage buckets, or even in the removal carts; if the buckets or carts are left open for a few minutes flies at once swarm in, to remain. The night-soil, therefore, which comes from bazaars as well as barracks, arrives at the trenching grounds full of eggs. If too much is deposited in one pit, if the soil is spread in lumps, or if it is a very loose or sandy one, flies breed out in from ten to thirty days' time, according to temperature, 4,000 flies per one-sixth of a cubic foot having been counted coming out from trenched soil. It is obvious, therefore, that trenching requires very careful supervision, half the battle being at the latrines and half at the trenching grounds. Of the four large stations in the division I found that two had suddenly dropped their enterica to a small figure, while the other two still continued at their old rate of 30 per 1,000. Flies were numerous in all the stations, especially after the rains. The only difference I could make out between these stations was in the trenching. At the stations where good trenching was the rule the rate was low, but at the other two numerous flies were being bred at the trenching grounds which could easily find their way into barracks. This only confirmed what had already been pointed out by Colonel Aldridge, at that time Sanitary Officer at Headquarters, who showed that the enteric rate at the different stations in India varied directly with the distance of trenching grounds from the station. That is to say, Calcutta, Bombay, and Rangoon, having distant trenching grounds had also very little enterica, while the majority of stations with these grounds close to barracks had very high rates, and I distinctly remember hearing him say at that time that there was not a single trenching ground in India that did not breed flies. As flies were still numerous in Mhow, it was evident, then, that it was the trench-bred flies that had made the difference, but the difficulty there, as at Campbellpore, was to understand how the infection was carried. The sun temperature in India for months at a time is over 150° F., or 65° C., which is bactericidal, quite apart from any inherent power of the sun's direct rays. When a trench has been covered up for a fortnight, the length of time the flies take to crawl out of their shells, any intestinal bacteria present on the surface must be killed, a fact that I have proved by bacteriological examination. The newly hatched flies crawl about on this burning soil, and when their wings expand they fly in the sun, eventually reaching barracks on the backs of men, bullocks, or horses. If new trenches are covered over quickly there is nothing for them to feed on until they get to barracks, where the latrines were necessarily avoided on account of the antiseptics so freely used, and yet flies appeared to be the cause of enterica in cantonments. The only explanation seemed to be that it was the excrement of the fly that contained the infection, and that this must have been acquired in the larval stage.

[1] *Journ. State Med.*, October, 1915.

About this time I was sent to Kampti to investigate an outbreak, and, as usual, I could find no definite cause, but I brought back some flies caught in the infantry and artillery kitchens. These I burnt in a flame, afterwards washing them, and, subsequently, I emulsified them in sterile saline solution, about ten at a time. The washings were sterile, but from the emulsions I recovered *B. typhosus*. Following this, in order to prove that the fly was a carrier, I put a box of earth under mosquito netting, and on the surface of it I put some fæces from a typhoid patient, allowing flies caught in my laboratory to settle on this. In about a fortnight a crop of a dozen flies had hatched out, which I kept alive on sugar and water after taking away the box of earth. I examined them, one or more at a time, on the second, sixth, ninth, thirteenth and sixteenth day after their hatching, the routine of washing and emulsifying being gone through as before. On each examination the washings were sterile, but from the emulsions I recovered *B. typhosus* every time. I repeated this experiment with fæces from a patient suffering from paratyphoid A and got very similar results. Thus from the excrement of three flies seven days old, and also from emulsions obtained from their flamed bodies, I recovered *B. paratyphosus* A.

B. typhosus has been found in flies by numerous observers. In 1911, Graham Smith and others also showed that the bacillus can be carried through the chrysalis stage and be recovered from the fly after emergence. *B. paratyphosus* B has been recovered in a similar way. Let us look at it in another way. The eggs of a fly are sterile masses of albumin. When the larva breaks through it is presumably sterile also, but it begins to feed immediately on the filth in which the eggs were laid. After this the intestine can be seen as a black thread, and if an emulsion be prepared and examined the microbes obtained are of a similar character to those obtained directly from the excrement it fed on, whether fæces, horse or cow dung. The same contents are to be found in the intestine common to both fly and pupa. It seems only natural that the intestinal flora of the larva should depend on what it first fills its inside with. I think a fly defæcates about twenty-five times a day. On examination of the excrement it is found to consist chiefly of microbes, probably from 5,000,000 to 10,000,000 in each dot. I have myself kept a fly alive on sugar and water for sixteen days, but they have been known to live for four months. A loaf of bread is issued to a soldier in the morning, and it has to last him until the next day; if this bread is left about, as it often is, the risk of fly pollution is very great, the possibility of microbes deposited on a moist soil like the inside of a fresh loaf remaining unchanged for twenty-four hours being fairly certain. The new physiology tells us that fluids leave the stomach very quickly. India is a thirsty country, and microbes deposited on bread or coffee-shop cakes, eaten in conjunction with tea or lemonade, may easily escape being killed by the acid in the stomach, and pass quickly into the small intestine, where the alkaline soil is suitable for further growth.

The chief sources of fæcal-bred flies are trenching grounds, bazaar road rubbish, when collected in heaps or used as manure, and under certain favourable conditions fæces passed outside latrines.

Does the theory that the enteric rate depends on the number of fæcal-bred flies account for the peculiar incidence of the disease in India?

(1) *Seasonal Prevalence*.—In the spring and autumn, when enterica is highest, flies are at their worst. Quetta, in the north, has no enterica in the winter because it is too cold; but, on the other hand, in Secunderabad, where fever used to persist all the year round, there is no real cold weather to stop flies breeding in the trenches.

(2) *Station Prevalence*.—As I have already explained, Calcutta, Bombay, and other places with distant trenching grounds had little enterica, simply because there were no trench-bred flies, while the majority of stations with trenches close at hand had a great deal.

(3) *Prevalence amongst Mounted Troops*.—It is well known that horses and bullocks collect flies, horses especially passing by trenching grounds for daily exercise and other reasons in a way that men in the infantry do not. Garrison gunners generally live in forts, and are, on the whole, farther away from trenching grounds than infantry.

(4) *Six or Eight Weeks' Phenomenon*.—When troops go out to camp or on a campaign they begin trenching at once. It takes from a fortnight to a month, according to the temperature, for flies to hatch out; therefore, if we allow a week in addition for infection, a fortnight for incubation, and another week before the diagnosis is made, the phenomenon is explained. Flies bred from horse-dung may be present all the time, but nothing happens until the trench-bred flies arrive. The phenomenon does not occur in England, simply because the soil temperature is not high enough for flies to breed in trenches. I have known troops to camp year after year in the same spot for three months without any enterica occurring.

In summing up his excellent article, Lieutenant-Colonel Faichnie states that by inoculation we have undoubtedly increased immunity; but we have also struck a severe blow at the actual cause of enterica in India. Opinion as to how this has been done varies between diminution of flies and isolation of carriers. I consider the excrement of fæcal-bred flies to be the most important factor, because in so many instances the absence or presence, decrease or increase of enterica, bears a direct relation to the numbers of fæcal-bred flies present. I can see no corresponding relation between the numbers of carriers and cases of enterica. Fæcal-bred flies give a reasonable explanation of the peculiarities of Indian enterica, but I cannot see how they can be explained by the theory of direct infection. I do not for a moment wish to say that direct infection, or other causes, has not given rise to enterica at all. Far from it; it is the large incidence attributed to these causes that I object to. Calcutta

and Bombay with no trench-bred flies had an average rate of about 3 per 1,000. My idea is, that if we could subtract cases due to flies bred in fæces deposited outside latrines we would get some idea of the average amount in India due to causes other than fæcal-bred flies.

In conclusion, may I say that I hope I have made out a strong case against the excrement of the fly in question, and if so, I think you will agree with me that it would take another paper to set forth the deductions that may be drawn from it; but I will only say now, that although it is almost impossible to exterminate flies in India, to tackle those bred in fæces is quite another matter, and the very first thing I would recommend is that we abolish the regulation 12-in. shallow trench while on active service in tropical climates.

INFANTILE SCURVY.[1]

By **Alfred F. Hess.**

Broader symptomatology and pathology afford a basis for linking it to other "deficiency diseases," for example, beriberi, and finally this relationship is strengthened by the results obtained with certain dietetic therapy.

In addition to the classical signs of infantile scurvy—the hæmorrhages into the gums or beneath the periosteum—a careful examination frequently will reveal involvement of the circulatory system. Most noteworthy of these is *an enlargement of the heart, and more especially the right heart*. This sign can be elicited, when it is fairly marked, by percussion; in several instances we have detected it in this way. In three cases, the signs have been substantiated by means of the Röntgen ray. The one infant was aged 14 months and had been under observation in the institution since he was about 2 months old. He had been on a diet of milk and of cereal, without the addition of orange juice, for about four months. Mild scorbutic symptoms had gradually made their appearance: pallor, stationary weight, peridental hæmorrhage, and a few petechiæ of the skin and of the conjunctivæ. In the course of careful physical examination we were surprised to note the marked increase of cardiac dulness, which extended fully 1½ fingers to the right of the right border of the sternum, and to the left somewhat outside the nipple. The heart sounds were muffled at the apex but clear at the base. The pulse was rapid and regular. Numerous Röntgenograms were taken, and all showed approximately the same cardiac enlargement. A fluoroscopic examination was made in order to see whether there was fluid in the pericardial sac, a condition which was once noted *post mortem*. However, there was no appreciable amount of fluid observed within the pericardium.

Definite cardiac enlargement to the right was demonstrated both by clinical and by Röntgenographic examination in all three infants. In the majority of cases, however, both percussion and the Röntgen ray showed normal heart outlines. In some of these, the presence of tachycardia would seem to indicate that the circulatory system was not entirely spared. This rapidity of heart action was constant, and in the case of an infant 8 months old was found, on repeated examination, to reach 180 beats or more. In conjunction with this increased frequency of the pulse, an increased respiratory rate was noted.

Clinical descriptions omit any mention of involvement of the heart. Barlow states that "there is nothing to note regarding the heart and lungs." Necropsy protocols usually are incomplete and unsatisfactory in this regard; there are some, however, which are significant. In the monograph on this subject by Schoedel and Nauwerck,[2] five careful necropsy protocols are reported. In two instances the hearts were apparently normal. In the others we find the following record, which is passed over without comment:—

(1) Pericardial fluid somewhat increased, both ventricles moderately dilated, the right somewhat hypertrophic.

(2) The heart showed a hypertrophy of the right and left ventricles, as well as dilatation of the right ventricle.

(3) The right ventricle is dilated and slightly hypertrophied, the muscles pale and tough.

As is well known, œdema constitutes a not infrequent symptom of infantile scurvy. This manifestation, however, has not been given the prominence which it should be accorded. In our experience subcutaneous œdema is not only one of the most constant phenomena in the symptomatology and pathology of this disorder, but deserves special consideration because it appears in a peculiar clinical form and frequently is one of the earliest indications of threatening scurvy. From the nature of our investigation, we had a peculiarly favourable opportunity to observe the earliest signs of this disorder. In addition to the somewhat characteristic pallor which has been so often depicted as a warning signal, we noted œdema, involving most regularly the eyelids, especially the upper lids. The puffiness was met before any symptoms of hæmorrhage could be found, whether bleeding into the gums or red cells in the urine, and persisted when the disorder was disappearing under appropriate dietetic treatment. The œdema, however, is far more widespread. *Post-mortem* examinations have clearly demonstrated this fact. Any one who has incised the subcutaneous tissues to reach the long bones must have noted the moist and infiltrated condition of these parts. The reason this pathologic state has played so small a *rôle* in the symptomatology of infantile scuvry is that the œdema differs clinically from that usually encountered; in other words, it does not pit on pressure. This

[1] Abstracted from *Journal of the American Medical Association*, September 18, 1915.

[2] Schoedel, J., and Nauwerck, C., "Untersuchungen über die Moeller-Barlow'sche Krankheit," Jena, 1900.

peculiarity is ascribable to the fact that it infiltrates the layers of the integument and the underlying muscle, rather than being diffused in the loose subcutaneous areolar tissue. It is a firm œdema, causing some glossiness of the overlying skin, which is rendered difficult to wrinkle or to pinch between the fingers. Indeed, at times one is in doubt whether œdema is actually present, until one compares the texture of the tissues with those of a healthy infant of about the same age and weight. This firm œdema occurs most frequently over the anterior aspect of the lower end of the leg. The œdema is probably due to a nutritional disturbance of the smaller vessels which allows fluid to permeate the walls.

As has been mentioned above, this transudation involves the muscles of the body as well as the subcutaneous tissue. Barlow described an "infiltration of the intercostal muscles." It is probable that when œdematous fluid is poured out into the muscles of the thigh the swelling is not infrequently wrongly diagnosed as due to subperiosteal hæmorrhage. This has been our experience. It will be noted that in spite of the manifestly increased diameter of the affected thigh there is no augmentation in the width of the bone and no typical elevation of the periosteum as is to be seen when hæmorrhage has occurred, but that the difference is due solely to an infiltration of the muscular layer.

The consideration of subperiosteal hæmorrhage which, as is well known, is accompanied by exquisite pain and tenderness, raised the question as to whether we are correct in ascribing all pain in the extremities to such involvement. It is difficult to answer, as the interpretation of pain in an infant is an unsatisfactory clinical task. It seemed after careful study, however, as if in some instances there was a tenderness of the skin or of the muscles, quite dissociated from that of the bones, which might be attributable to an involvement of the nerves. Further investigation was suggestive, although not conclusive, of involvement of the nervous system. The knee reflexes in almost all instances were markedly increased; in one case they were almost absent on repeated examination. Tests of the reaction of the nerves (median) to galvanism were not definite. An examination of the retinas showed œdema around the discs in the two cases which were furthest advanced. As far as can be ascertained no ophthalmoscopic examinations have been made in infantile scurvy, but it will be interesting to learn what retinal examinations in other cases will show. In this connection it is quite possible that the pathogenesis of the cardiac enlargement is an involvement of the vagus. It is difficult to understand the predisposition of the right heart to enlarge unless we associate this with a disturbance of the circulation in the lungs. The frequent occurrence of pneumonia in the course of scurvy adds weight to this view.

The syndrome sketched brings infantile scurvy into actual relationship with some of the other "deficiency diseases," and more particularly with beriberi. These two diseases are commonly grouped together, merely because they have one factor in common—they can be cured by the addition of a definite food to the diet. As beriberi frequently attacks infants, it is possible to go further and to compare these two diseases in patients of this tender age. We are indebted to Andrews[1] for a comprehensive clinical and pathologic account of the beriberi which is commonly encountered in the Philippines among infants who are nursed by mothers suffering from this ailment. It differs but little from the beriberi in adults described so completely by Vedder.[2] Hæmorrhages occur, but are by no means constant. Cardiac dulness is increased, especially to the right, and the heart sounds are muffled. The pulse is rapid, from 130 to 170 or more, and dyspnœa is almost always present. At necropsy, hypertrophy of the heart is found; "the wall of the right ventricle equals or exceeds that of the left." Œdema is common, the skin having "a tough, leathery feel," and *post-mortem* examination shows that "the subcutaneous fat is present apparently in good amount, greyish white, and very moist"; in many cases a general œdematous condition is present. Examination by means of the electric current was unsatisfactory; however, a degeneration of the nerves (vagus, phrenic, intercostal, anterior tibial) was established, although this was "not as extensive as is found in cases of adult beriberi."

We can hardly review this summary of "infantile beriberi" without being struck by the similarity between this disorder and infantile scurvy as sketched. There are some factors which are evidently dissimilar, but the differences are not such as to obscure the evident clinical and pathologic relationship between them. They show, nevertheless, that we are not dealing with one and the same disease, for it is clear that the characteristic symptom of infantile scurvy is hæmorrhage, whereas that of beriberi is nerve degeneration. It is also evident that the œdema is much more marked in the latter disorder. It must be borne in mind, however, that in adult beriberi there is a dry as well as a wet form, and also the exceptionally infantile scurvy leads to the appearance of general œdema. I myself have seen an instance of this kind, and others have been reported from time to time. One of the very first cases described in this country showed œdema not only of the feet and legs, but also of the scrotum. It should be investigated whether this peculiarity is to be ascribed to the idiosyncrasy of the patient or to the constituents of the diet.

Thus we see that the relationship between infantile scurvy and beriberi, which has rested on the basis of analogy, has also the foundation of symptomatology and pathology. Numerous interesting observations would seem to have rendered probable such intimate kinship. Guinea-pigs fed on decorticated or highly milled rice developed scurvy and

[1] Andrews, V. L., *Philippine Journ. Sci.*, April, 1912, p. 67.
[2] Vedder, E. B., "Beriberi," New York, 1913.

not beriberi, as well as a degeneration of the nerves in some of the animals. In man, Darling[1] reports that "in some African negroes a diet that causes scurvy in one set of men causes neuritis in others." He also showed that in adult scurvy there may be found "right-sided hypertrophy and degenerative changes in the vagus and all its branches."[2] The data reported serve to link some of these observations together.

It is evident that infantile scurvy, adult scurvy and beriberi have many factors in common, viewed from a symptomatic as well as from a pathologic standpoint. A test which I was able to carry out led to the conclusion that the scope of comparison may be enlarged to include the dietetic or therapeutic point of view. It will be remembered that almost all the infants who developed scurvy were receiving cereal (farina) as well as milk. This farina is the starchy kernel of the wheat, from which the outer layers have been removed. It has been repeatedly shown that beriberi is brought about by a diet of polished rice which has been deprived of its outer layer or pericarp. It has likewise been established that the addition of rice polishings to the food suffices to effect a rapid cure of beriberi in man, or of its counterpart, polyneuritis in chickens. In view of these facts and the clinical similarity between infantile scurvy and beriberi, we decided to substitute in place of the farina a cereal containing the outer layer of the wheat. To this end we obtained middlings, the middle layer of the wheat grain, which may be compared to the pericarp of the rice. A cereal was prepared consisting of two parts of middlings and one part of flour, and was given in place of the farina and in the same amounts. The caloric value of this food is the same as that of farina, and it was taken quite as readily, by most of the babies. No other change whatsoever was made in the diet. In some instances, improvement was immediate and striking; there was a gain in weight for the first time in many weeks, a brightening in the appearance and in the disposition of the infants, and a recession of the typical scorbutic symptoms. This improvement was maintained for some weeks. The effect, however, could not be compared to the miraculous change brought about when orange juice or the juice of orange peel was given. The addition of middlings, which may be designated wheat pericarp, was not able to restore the infants to their natural vigour, even when it was given daily for a month or more. In some instances, especially when only a small amount of middlings was taken, no effect was observed. Judging from these experiences, it would seem as if this layer of the wheat grain possesses a small amount of the essential antiscorbutic substance, the vitamines of Funk, but an insufficient quantity to re-establish an adequate positive balance of the material. That the beneficial effect is certainly not attributable to its high fat content is evident when we reflect that the addition of cod-liver oil to the diet failed to bring about the least improvement in our previous study. The future must show whether infants fed on a cereal of this character develop scurvy, even though orange juice is not added to the diet.

Conclusions.

The pathology of infantile scurvy, including Barlow's classical account, is almost entirely devoted to a description of the lesion of the bones; little or no mention is made of the heart, the lungs and other internal organs. On the clinical side, attention has been focused on the evidence of hæmorrhage—in the gums, beneath the periosteum, in the urine, &c. In the foregoing paper the subject has been approached from a different point of view with an attempt to show that both the pathology and the symptomatology have a broader scope and that the heart is not infrequently involved. In several instances definite cardiac enlargement was ascertained by means of physical signs and Röntgen examination. Necropsies also show that the heart in some cases is hypertrophied and dilated. The examinations made during life, as well as those carried out after death, demonstrated that this enlargement was mainly of the right ventricle.

Another symptom which should be accorded greater significance is œdema, which is almost always present to some degree. This occurs early in the course of the disease and involves most frequently the eyelids. It is often manifested as a firm œdema over the lower end of the tibia, infiltrating the skin, and is readily overlooked, as it does not pit on pressure. This extravasation, which is due to nutritional disturbance of the smaller vessels, may also infiltrate the muscles. When this occurs in the thigh and causes swelling, it may be mistaken for the typical subperiosteal hæmorrhage.

It would also seem probable that the nerves are involved in infantile scurvy. The knee-jerks are increased, and there are indications of superficial tenderness of the limbs and neuro-œdema of the optic discs.

In the light of this symptomatology and pathology, infantile scurvy assumes actual relationship to beriberi, in which the right heart is also hypertrophied and the nerves invariably involved. This correlation was emphasized still further by a dietetic test modelled after the treatment of beriberi, which, as is well known, is brought about by a diet of polished rice which has been deprived of its pericarp, and is cured by the addition of rice polishings to the diet. In our study, the addition of middlings—the pericarp of the wheat—caused in many instances a prompt amelioration of the symptoms, although it did not suffice to cure the disorder. This indicates the advantage of giving a cereal which contains the outer layers of the grain when the diet includes no other antiscorbutic food.

[1] Darling, S. T.: "The Pathologic Affinities of Beriberi and Scurvy," *Journal Amer. Med. Assoc.*, October 10, 1914, p. 1290.

[2] In these cases the knee reflexes were increased as in our cases of infantile scurvy. These reflexes were likewise exaggerated in a group of about twenty-five men suffering from beriberi, whom I have examined recently, at the Government quarantine station, with the kind permission of Dr. Teague.

Original Communication.

LEISHMANIA PROBLEMS: OBSERVATIONS ON A RECENT CONTRIBUTION TO THE SUBJECT.

By C. M. Wenyon.

Director of Research in the Tropics to the Wellcome Bureau of Scientific Research.

Researches which were undertaken by Laveran and Franchini during the last year or two have thrown considerable light on our knowledge of insect flagellates and have opened up an entirely new field of study. These experiments have been repeated and somewhat extended by Fantham and Porter, and seem to have so modified the views of the former of these observers that Fantham has written a paper presumably with the object of showing how it is that leishmania investigations in the past have not been productive of greater progress. In this remarkable contribution[1] Fantham, to whom I shall refer below as the author, combines an account of some most interesting experiments on insect flagellates with a review or criticism of investigations and methods of investigation on the subject of leishmaniasis, and attempts to explain why, as it appears to him, during the last generation the progress of our knowledge in the domain of protozoology, although rapid, has not been so great as it might have been.

A claim of this nature, of course, is true of all human progress, and must be true so long as we remain fallible human beings, but it is surprising to read this complaint of lack of progress, which appears somewhat contradictory when in the first paragraph of his paper the author says that "vast strides" have been madê during the latter half of the period of which he speaks in our knowledge of animal parasites, especially of the inter-relationship of protozoa and arthropods in the propagation of disease. If it were not that he ascribes this deplorable lack of progress to the work being "in the hands of medical men whose knowledge of zoology is of the slightest," and that he makes several quotations from writings of my own in order to substantiate his views and illustrate his lamentations, I should hardly think his contribution worth reply; and when, further, the author writes in reference to a view of mine—a view which has received the support of very able zoologists who are not medical men, and a view which I still regard as substantially correct—"I deeply regret the necessity for making these remarks; there is nothing personal in them, but the facts are there and cannot be gainsaid," I really think it would be unjust to allow such assertion to remain unchallenged.

Let us examine the paper in greater detail. The explanation of the lack of progress in the realm of protozoology is best reproduced in the author's own words. They are these: "In the domain of protozoology, with which the present paper is concerned, the progress, though rapid, has not been so great as it might have been. Some of the reasons for this are that the work is in the main in the hands of medical men whose knowledge of zoology is generally of the slightest and their acquaintance with the comparative aspect of the subject just as limited, while the few zoologists engaged have in some cases drifted into a narrow outlook and become lost in academic terminologies and discussions."

Such a statement of the case would undoubtedly appeal to many if they were unaware of the remarkable fact that practically all the great discoveries in connection with the parasitic protozoa of human disease have been made by these very same medical men. The very observations which appear to have stimulated the author to this outburst of feeling have been made by medical men in whose footsteps he has recently followed. The mere discovery of parasites does not, as a rule, require very great skill, still the names of Laveran, Bruce, Leishman, Dutton and Ford, Wright, Chagas, and many others, are sufficient to show the position held by the medical investigators. The parasites of the diseases being known, the same medical men again extended their observations on these organisms till, in many cases, they reached "full fruition," with the result that Ross discovered the mosquito transmission of malaria, Kleine the explanation of the tsetse-fly transmission of the trypanosomes of Africa, Chagas the Conorhinus transmission of the human trypanosome of South America. In this category must be included the mosquito transmission of yellow fever, though the causative parasite is still unknown. It is these medical men who have explained the carriage of intestinal protozoa from man to man by means of encysted forms, and it was Rogers who made the observation that the leishmania was really a stage in the development of a flagellate, an observation which everyone has recognized is of great importance. It was Leishman again who, employing the comparative method, the lack of which the writer so much deplores, recognized in the leishmania a structure resembling certain rounded forms of trypanosome and was led to write a paper on the possibility of the occurrence of trypanosomiasis in India—an insight which in my opinion was worthy of greater credit than the mere discovery of the organism itself. In connection with the protozoa of human disease, owing to the labours of these medical investigators there has accumulated an enormous amount of information, so much so that we know far more about the habits and ways of the protozoa producing disease in man than any other parasites of this group. The great bulk of the information has, of course, been accumulated with the object of preventing disease and will probably appear of little value to those who lack medical training. It is a curious anomaly that the author of the paper under review does not realize that practically all the investigators he quotes in his

[1] "Insect Flagellates and the Evolution of Disease, with Remarks on the Importance of Comparative Methods in the Study of Protozoology," *Ann. Trop. Med. and Parasit.*, June 30, 1915.

paper and upon whom he gives his blessing are also medical men.

Having regard, therefore, to the wonderful discoveries which have been made by medical men in the realms of protozoology—discoveries which have alleviated the sufferings of thousands of human beings and which have opened up possibilities of prophylactic measures which were never dreamt of a comparatively short time ago—I fail to see any justification for such a pessimistic view of the situation as presented to his readers by the author. I feel sure that even without such guidance as his contribution affords the medical men will continue their leishmania investigations, faulty though they may appear to him, with a final success just as great as that which has followed their researches in other branches of protozoology.

In another place the author writes in reference to investigation on *Leishmania tropica* and *L. infantum*: "The successful cultivation of *L. tropica* and *L. infantum* again did not advance matters, but discussion arose as to the number of valid species of leishmania and numerous attempts were made to inoculate the viruses into laboratory animals. Although expeditions were organized for the study of leishmania in endemic areas, it never seems to have occurred to those working thereon to try to introduce herpetomonad flagellates of insects into vertebrates. Apparently, vertebrates, being thought much more powerful and important animals than invertebrates, must perforce be primarily considered and experimentation undertaken with them viewed as the principal host. Unfortunately, human suffering has paid dearly for this one-sided view, which is only equalled by the ridiculous arguments that used to occupy the attention of the amateur parasitologist and waste the time of learned societies as to which was the primary or principal host of a digenetic parasite." As regards the attempts to inoculate leishmania into vertebrates with a view to finding a susceptible host, it would be useful for the author to turn his attention to trypanosomes. It was the fact that experimental vertebrate hosts were known which made tsetse-fly experiments easy, and it is certainly true that if these had been wanting our knowledge of trypanosome transmission would be very far behind what it is now. The trypanosomes and leishmania are not so far removed from one another that the search for a vertebrate host for the latter whereon to conduct experiments with insects is such a futile or ridiculous investigation as the author thinks. It is, perhaps, not too much to state that if a satisfactory vertebrate host were discovered for the leishmania we would not have to wait long for the solution of the leishmania problem. Quite recently (*Bull. Soc. path. exot.*, December, 1914, p. 722) Brumpt makes the statement that it was owing to the fact that *Cercopithecus ruber* proved as good a host for *Trypanosome cruzi* as for *T. gambiense* that he was enabled to demonstrate the *rôle* played by the dejecta of the Conorhinus in the transmission of *T. cruzi*, and on these lines of investigation the author lays the blame, and says that human suffering has dearly paid for this one-sided view. One would ask the question, Is it not almost universally true that wherever human suffering has been lessened by researches in the domain of parasitology it is the medical men, "whose knowledge of zoology is generally of the slightest, and their acquaintance with the comparative aspect of the subject just as limited," rather than the zoologists, who have contributed to this end? I ask this question without wishing in any way to cast reflection on the researches of the zoologists, which have their value in other directions, but it is only natural that the questions of disease prevention, treatment, and other kindred subjects would have a greater appeal to those who have been medically trained.

Another line of investigation opened up by the successful culture of leishmania, which the author says did not advance matters, is the search after a possible vaccine. The knowledge that such vaccines could be obtained from bacterial culture naturally led the comparative mind to regard as possible the preparation of such a vaccine from cultures of leishmania. It is not the fault of investigators that so far no such vaccine has been prepared. I should like to remind the author that though the problem of the method of transmission of leishmania is a very important one, it is not the only one of interest, and that such subjects as which is the primary host of a digenetic parasite are most fascinating and important from the point of view of the evolution of these parasites and cannot be neglected if we are to arrive at a clear understanding of their history and development.

Laveran and Franchini made the remarkable discovery that certain flagellates supposed to be peculiar to insects are inoculable into vertebrates, where they produce infections which bear resemblance to the infections due to the leishmania. Laveran and Franchini stated that this observation would alter our view of the subject of leishmaniasis, but realizing the true value of their work, and being doubtless acquainted with similar infections produced by other types of organism, they did not at once conclude that they were dealing with actual kala-azar in animals, though the possibility of this occurred to them.

I myself, on December 19, 1913, read a paper before the Society of Tropical Medicine and Hygiene, a paper which was produced in the *Transactions* of the Society, and which appears to have escaped the attention of the author. In this paper I made the following suggestion: "It is most probably correct that all the blood-inhabitating flagellates of the trypanosome group were originally parasites in the insect gut alone. Before they were adapted to a vertebrate host the individual insects became infected from one another by the small encysted leishmania forms which are found in the fæces. This happens with the flea flagellate, for the leishmania forms are found in the fæces and are eaten by the larval flea. Now when a trypanosome, for instance, has become perfectly adapted to a vertebrate host, there is no longer any necessity

for the arthropods to infect themselves from one another by means of leishmania forms found in their fæces, though as far as we know some of them may still do so, because they can more certainly take up the parasites which now maintain themselves in the blood of the vertebrate. But it is quite conceivable that a flagellate of an insect like the flea, which naturally passes from insect to insect directly, may become adapted to a vertebrate host, so that the insect in question may be able to infect itself in two ways, either by feeding on the blood of an infected vertebrate, or by eating the fæces passed by an already infected insect. It is possible that the leishmania diseases are of this type and that we have to do with a flagellate of an insect which naturally passes from insect to insect directly, but occasionally obtains a footing in the human body, producing the diseases of kala-azar and Oriental sore." This appears to be the view advocated by the author, and perhaps if he had read the above quotation he might have ben saved the trouble of writing some portions, at least, of his contribution.

This view was suggested by me as a possibility, but I am far from agreeing that the infections produced in animals by Laveran and Franchini, and which have been repeated and extended by Fantham and Porter, are in reality leishmaniasis, especially as the latter observers have shown that infections can be produced by injecting flagellates of arthropods whose association with warm-blooded vertebrates is out of the question. They are possibly of the nature of those temporary infections which can be produced by injecting bacteria which normally have no association with vertebrates. Because certain insect flagellates are able to survive when injected into the body of vertebrates it does not follow for an instant that they are necessarily natural parasites of vertebrates. This is all the more true of such a flagellate as that of the water scorpion. How in nature can one suppose the flagellate of this aquatic insect to be a parasite of a warm-blooded vertebrate? The fact that such a flagellate can multiply and survive when injected into such an animal is very interesting in showing how certain non-parasitic forms (so far as the vertebrate is concerned) can survive in this manner. It also shows how easy it would be for such a form to become parasitic in vertebrates in nature and is comparable with the occasional survival of free-living protozoa which have accidentally entered the intestine of some animal, and possibly to such survival of truly intestinal forms, such as lamblia, when they exceptionally gain entrance to the blood. We can see in these cases how easily free-living forms may become parasitic, and how forms which are already parasitic may have their type of parasitism altered, but it does not prove that such insect flagellates are already parasites of vertebrates, that such free-living protozoa are already intestinal parasites, nor that such intestinal parasites as lamblia are to be regarded as parasites of the blood. At any rate, the truly scientific mind will withhold itself from dogmatism upon this point till sufficient proof has been produced.

The author takes objection to certain remarks I made on the question of the development of leishmania in the bug into flagellates of the leptomonas type. Patton first showed that the leishmania of kala-azar, when taken up by the bug, develop into flagellates of the leptomonas type. I repeated this observation, as did Patton also, for the leishmania of oriental sore. Realizing that the type of infection produced in the bug was quite unlike those flagellate infections of insects with which I was acquainted, I thought it possible, as did Mesnil, of the Pasteur Institute, before me, that the leishmania had developed into flagellates in the gut of the bug because there was abundance of blood there —that the stomach of the bug acted as a culture tube. By way of testing this point, I studied the behaviour of other flagellates in the gut of the bug —flagellates like *Trypanosoma lewisi*, which naturally did not belong to the bug—and I found that they underwent an evolution which was an imitation of the development in the culture tube. Was it to be wondered at that I should think it possible that the development of the leishmania in the gut of the bug was not the type of development one would expect to find in the true host? I was led to this conclusion by a truly comparative method, and I still think it to be correct that the stomach of the bug can act as a culture tube of blood medium and that developmental changes undergone by a flagellate there are not, in themselves, a proof that the bug is a natural host of such a flagellate.

In spite of his objections to my criticism of the bed-bug hypothesis, I cannot quite gather from the author's remarks on these bed-bug experiments whether he wishes to support the view of transmission of kala-azar by the bug or not, for it is difficult to reconcile his later statement that he regards the parasite of kala-azar as identical with the flagellate of the flea. If the flagellate of the flea is the leishmania, then, the flea existing as it does in kala-azar centres in India, it is hardly necessary to assume the presence of another carrier in the shape of the bug—a host which has never been shown to be naturally infected with such a flagellate and in which infection, when artificially produced by ingestion of leishmania, assumes a character quite different from that of naturally infected insects which are true hosts of flagellates.

But why should it be regretted that those putting forward and supporting the latter remarks did not more carefully consider the suggestions and inferences to be drawn from cultural methods, and proceed forthwith to experiment directly with the herpetomonads found in insects? Did the author himself proceed forthwith with such experiments? Apparently not till Laveran and Franchini had shown him the way, when he undertook the comparatively easy task of repetition.

In another place the author writes: "We had the floodgates of destructive criticism opened when Basile suggested that *Leishmania infantum* was transmitted by fleas, though it does not seem to have occurred to any of his critics to begin experiments on the effect of flagellates of fleas when

introduced into vertebrates they infest." This remark would be the more comprehensible if it were not a fact (as we shall see below) that the author himself took part in this criticism, and he himself also failed to commence the experiments he blames others for not having undertaken.

Basile claimed that the flea in Italy transmitted kala-azar to dog and man, but Basile's results were open to criticism in that he failed to exclude from his experiments the "natural flagellates" of the fleas. In Malta I seriously studied the question, and what evidence I did get was certainly against Basile's views (*Trans. Soc. Trop. Med. and Hyg.*, December 19, 1913).

We now know, thanks to the researches of Laveran and Franchini, that these "natural flagellates" of fleas can produce infection in vertebrates, but Basile took great trouble to explain the difference between the "natural flagellates" of fleas and the flagellates in fleas due to leishmania. And the author himself wrote in connection with Basile's experiments (*Brit. Med. Journ.*, November 2, 1912) that "Basile in his transmission experiments of leishmania from dog to dog by means of fleas has not entirely precluded the possibility of his having mistaken forms of *Herpetomonas ctenocephali* for leishmania." It was in this paper that the author, without any experimental or other evidence, created the name *H. ctenocephali* for the flagellate of the dog-flea, and in it also he says, in reference to *H. pediculi* of the body and head-louse, that it has no connection with either leishmania or trypanosoma. These quotations and, indeed, the whole paper, when compared with the one now under discussion, afford a most instructive illustration of the way in which later investigations may lead the most careful observer to change his views. In the author's own words I would reply, "The pity is that the author before penning these remarks did not himself endeavour to determine experimentally whether *Herpetomonas* might not acquire the power of living and developing in a vertebrate," and I think it a pity he has not told his present readers something of his own former expressions of opinion before criticizing so adversely the views and researches of others.

It may be of interest to recall that as far back as 1907 (see "Third Report Wellcome Research Laboratories, Khartoum," p. 246) I made attempts to infect rats with the flagellates of Tabanid flies. These attempts were not successful, or, what is more probable now that Laveran and Franchini's results are known, I missed the infection. Since that time I have made further experiments and have been working for some time with flea flagellates.

All serious attempts (Patton, Wenyon, Pareira da Silva) to produce a flagellate infection of fleas by allowing them to ingest leishmania have failed; further we know that flagellates of fleas occur everywhere, while kala-azar is limited in distribution. Is it surprising that some scientific minds are rather chary of making the dogmatic assertion that the leishmania and flea flagellates are identical? They await proof before accepting this narrow position, and still more before admitting that *H. pattoni*, *H. ctenocephali*, *H. pediculi*, *H. donovani*, *H. infantum*, and *H. tropica* are one and the same species, for if so, why do the fleas only produce kala-azar in certain localities and not in others? This is a very important question which will occur to any mind broad enough to grasp the subject from its widest standpoint. But the author appears even at present quite undecided, for in the paper under discussion he says that *H. pattoni* of the flea and *H. pediculi* of the louse belong to one species; yet in a paper which, judging from the dates quoted in the text, was written only a short time later (*Parasitology*, June, 1915, p. 134), we find him making the statement that *H. pattoni* is a specific parasite of fleas. If this be true, how can it be the same species as *H. pediculi* of the louse?

It was the author himself, as we have seen above, who was responsible for the creation of two of these species, *H. ctenocephali* and *H. pediculi*, a few years back. He certainly did this without the experimental evidence necessary, and now we find him, still without the evidence, changing over to the other extreme.

I have made a number of cross-experiments by way of testing the specificity of these flagellates, but as the result is inconclusive I have not considered it worth publication. But because these insect flagellates are many of them morphologically similar to one another it does not follow they are identical. In the group of trypanosomes uniformity in structure is the cause of great difficulty in classification, so much so that some are not willing to admit an identity when, as with *T. brucei* and *T. rhodesiense*, many other than mere morphological resemblances have been shown to exist.

It is true that a great mass of literature on the subject of leishmaniasis has accumulated, but by far the greater proportion of it has to do with the clinical aspect of the disease, treatment, pathology, and other questions which are unfortunately outside the narrow curriculum of the zoologist. These questions are of utmost importance, and the wide range of subject only serves to illustrate the manifold interest of the medical man. It speaks well for the breadth of his education that he is able to appreciate the subject from such a variety of standpoints. Yet we find that the literature relating to leishmaniasis is small compared with that on trypanosomiasis and malaria, two subjects on which the author would admit, no doubt, that our knowledge had attained something like full fruition.

It is a little difficult to grasp what the author means by the comparative method. Apparently he applies it to a very special type of comparative study, namely, the study of insects from the point of view of their flagellate infections with a view to determining which of these flagellates will be found to infect vertebrates. If this is a comparative method then the reverse is one also, namely, the study of the vertebrate flagellates with a view to finding out the possibility of their infecting insects. It is this latter method which has given such good

results in trypanosomiasis. But I maintain that all investigations are of necessity based on the comparative method and that the author has no right to apply this name to any particular line with the object of casting reflections on other methods which may not be his.

As an illustration of the lack of application of the comparative method the author cites the parasite of kala-azar. He reminds us that the organism was described by Leishman and by Donovan in 1903 and that Rogers discovered its herpetomonad stage in 1904. "Though this discovery of Rogers was of fundamental importance, its application even to-day," so writes the author, "is only realized in varying degree by two or three British and French workers." A more inaccurate statement can hardly be conceived, for it was this discovery of the flagellate nature of the leishmania which has given rise to the almost universally accepted view that the disease is insect-borne and has led to a long series of investigations with insects similar to those which, in the domain of trypanosomology, has resulted in such marked success. One would imagine that the author had cleared up the whole question of kala-azar transmission, whereas the obscurity seems now greater than ever owing to the multiplication of possible alternatives.

I now wish to say something about the genus Herpetomonas, my views upon which seem to trouble the author very much. In 1912 I wrote, and this is quoted by him: "The genus Herpetomonas includes flagellates which have only one, and that an invertebrate host. The fact that the parasite of kala-azar has two hosts and can live and multiply in the organs of a vertebrate shows it to be profoundly different from the true Herpetomonas, which lives only in the invertebrate. This fact alone would be sufficient to establish the genus Leishmania. . . . When a Herpetomonas becomes so changed that it has acquired the power of living and developing as an intracellular parasite in the body of a warm-blooded animal, and giving rise to such a serious disease as kala-azar, we are justified in concluding that it has passed out of the genus Herpetomonas, from which it originated, into the genus Leishmania." The injustice of the author's criticism of this statement is that he makes it in the full knowledge that many of these insect flagellates are now known to be inoculable into vertebrates, whereas when I wrote neither the author, nor I, nor anyone else knew this to be true. The discovery, however, does not materially alter my views on this question, which is one of classification more than anything else. I explained my position more fully in a paper entitled "Observations on *Herpetomonas muscæ-domesticæ* and some Allied Flagellates," which appeared in the *Arch. für Protistenkunde* for 1913, and in it I defined what was my conception of the terms Leishmania, Leptomonas, Crithidia, Herpetomonas, and Trypanosoma.

I had investigated the Herpetomonas of the house-fly for some time and had come to the conclusion that morphologically it showed at some stage or another of its life-history every type of flagellate which enters into the series leishmania to trypanosome. I know quite well that some consider that the trypanosome forms do not belong to the cycle of development of the Herpetomonas, and have created for them a distinct genus Rhynchoidomonas. In my opinion, however, all these forms are merely stages in development of the one flagellate. I knew that this flagellate passed from fly to fly in the fæces and that it was generally regarded as a flagellate peculiar to the insect. I knew it to be the type of the genus Herpetomonas, so I suggested that the genus Herpetomonas comprised flagellates which showed in their life-history all types of flagellate from leishmania to trypanosome, passed from insect to insect in the fæces and did not live in a vertebrate. That was sufficient to distinguish it from a true trypanosome, with which it agreed in general morphology and differed in its mode of passage from insect to insect and its being peculiar to them. The subsequent discovery that it can be inoculated into a vertebrate and there give rise to a certain type of infection is far from proving that it does so in nature and is to be classed as a vertebrate parasite. Even if it be found to be a true vertebrate as well as invertebrate parasite it would still not be a trypanosome on account of the difference in its behaviour in the insect. In such a case it would come nearer to the leishmania proper, though the want of a trypanosome stage in the life-history of the latter would still separate it. My definition of the genus Leishmania was a flagellate which morphologically showed the leishmania and leptomonas forms and which lived in an invertebrate (the existence of the invertebrate host I assumed) and a vertebrate in which it was a true tissue parasite. The genus Leptomonas also had the leishmania and leptomonas forms and passed from insect to insect in the fæces, as did the members of the genus Herpetomonas. It differed from the genus Leishmania in not being a true parasite of vertebrates. It was not known then that many of the flagellates which I would have placed in my genus Leptomonas were inoculable into vertebrates, and could live and multiply there very much like the members of the genus Leishmania. The result of this fact if it be shown to occur naturally in nature, as would appear to be the case in some instances, would be to multiply the members of the genus Leishmania or to show that the existing members had a wider distribution than we thought. It is almost certain, however, though we have no absolute proof of this, that some flagellates of my genus Leptomonas exist which do not in nature infect vertebrates, and it is to these that the genus Leptomonas as I define it applies. The same remarks hold good for my genus Crithidia, the members of which differ from those of the genus Leptomonas in that they morphologically attain a higher stage of development showing crithidia forms but never trypanosome forms, as in the genus Herpetomonas. Should some members of the genus Crithidia be subsequently shown to be natural parasites of vertebrates as well as of insects, then we

should have to create a new genus for their reception. This would give us the following parallel series:—

Leptomonas,	Crithidia,	Herpetomonas,
Leishmania,	?	Trypanosoma.

In such a system we must never lose sight of the biological fact that if a classification is a natural one the various subdivisions are connected by intermediate forms which are difficult to classify. It is often purely a matter of personal opinion in which group they should be placed, and when we are dealing with organisms like the flagellates under discussion, some of which are, as far as we know, parasites peculiar to insects (monogenetic parasites), and some of which have adapted themselves to a life in a vertebrate as well (digenetic parasites), and some of which may be in process of so adapting themselves, it is not to be wondered at that the various groups into which we may divide them run into one another by almost inappreciable gradations. I have long held and taught that these parasitic flagellates were originally free-living monads, which have become, in the first place, adapted to life in an invertebrate intestine, giving rise to the genera (Leptomonas, Crithidia, Herpetomonas), and that finally some of these becoming adapted to a life in vertebrates also have produced the genera Leishmania and Trypanosoma, and possibly also another genus corresponding to the Crithidia. I did not for an instant imagine that our knowledge of these flagellates was complete, but so far as I can see my scheme of classification still holds, though some members may have to be removed from one group to another. The whole scheme of classification was based on the knowledge that there was no hard and fast line separating the groups, and the discovery that some of these flagellates can be inoculated into vertebrates is merely another proof of this close relationship. Surely, the author himself would admit that Patton's idea of including the monogenetic parasite (Herpetomonas) in the same genus as the digenetic parasite (Leishmania) was hardly as logical as my wish to retain them in separate genera, for there was then no question of the herpetomonas of the house-fly having a vertebrate host. It is even possible that the difference between a monogenetic parasite and a digenetic parasite might justify a distinction greater than that indicated by separate genera alone: one might even regard it as sufficient ground for a grouping in separate families.

The discovery of Dutton and Todd in 1903 of a flagellate of the leptomonas type in the Gambian mice does not upset this classification, but probably—though we do not yet know enough about Dutton and Todd's parasite—introduces another species into the group Leishmania. I do not know if the author has read my paper in the *Archiv für Protistenkunde*, but, if not, I am sure a perusal of it would lead him to see that my remark on the genus Herpetomonas is not such a lamentable contribution to the subject as he imagines, nor was it what he classes as the inevitable destructive criticism. I should have thought it constructive rather than destructive in that I drew attention to and emphasized a known and recognized difference between Leishmania and Herpetomonas, the one being a parasite of a vertebrate and an invertebrate, a digenetic parasite, and the other a parasite peculiar to an invertebrate, a monogenetic parasite, for not even Patton nor the author knew in those dark days that some of the so-called natural flagellates of insects were inoculable into vertebrates. As it happens, subsequent observations have left my classification very much where it stood.

Another example of the author's methods of argument is illustrated by his remarks on Rogers's works, which he justly styles as remarkable and far-seeing suggestions regarding kala-azar. Rogers wrote that the "stomach of some blood-sucking insect is the most likely place in which to find the natural development of the extra-corporeal stage of the parasite, and that some such insect is the most likely carrier of the infection. . . . But as to the most likely kind of insect to carry the infection we are on more uncertain ground, for experiment alone can determine this. Nevertheless, it is worth while to discuss which are the most probable kinds in order that precautions may be taken against them without waiting for absolute proof to be obtained." Rogers, it is well known, blamed the bed-bug, and the author reminds us that, acting on this assumption, excellent researches and preventive measures were undertaken by Dodds Price at the suggestion of, and latterly in collaboration with, Rogers in the Assam tea gardens, and yet he follows with this remarkable assertion: "It has remained for workers in laboratories in temperate zones away from leishmaniasis material, again to point the way to preventive measures and to indicate the origin of the disease." Surely Rogers's preventive measures did not originate in any laboratories in temperate zones, nor were Basile's flea experiments conducted away from material: how then can the author consider that the origin of the disease has been indicated where and in the manner he claims? Because certain insect flagellates are inoculable into vertebrates and there produce a type of infection resembling leishmaniasis, it is far from being proved that the origin of leishmaniasis in man, kala-azar, and oriental sore has been discovered. A comparison with what is known of the history of trypanosome investigations should prevent such hurried conclusions.

Again, though these flagellates are also inoculable into cold-blooded vertebrates, and though flagellates of the same type can be cultivated from the organs of lizards, as has been done by Sergent and others at Biskra, it is far from proving that these flagellates all belong to one species, and therein is solved the whole problem of leishmaniasis. A recent paper by Laveran in the *Bull. Soc. path. exot.*, March, 1915, throws considerable doubt on the idea of a lizard reservoir for the leishmania of oriental sore. Surely it is possible that just as many distinct types of leishmania infection exist as trypanosome infections, and that the difficulty of distinguishing them

depends on the difficulty of separating the various parasites morphologically?

The observations of Laveran and Franchini are of very great interest, as also are the extensions of these experiments by Porter and Fantham, but they do not justify the wholesale assumptions made by the latter observer, and the condemnation of those who hold views different from his own. It is certain that these results open up fresh fields of investigation and thought, but it is early yet to dogmatize upon the final result. "Legitimate criticism," to use the author's words, "is always welcome, but when it degenerates into mere retort and negation it is subversive of progress."

In the course of any investigation some sudden and unexpected observation may occur which will alter the whole point of view of the subject, but it does not follow that the labours and discussions of those who worked before this time were useless or ill-advised. The history of kala-azar affords an excellent illustration of this. The discovery of the parasite of the disease immediately showed that all the older views—the malaria view, the ankylostome view, &c.—were wrong and the point of view was changed. Rogers's discovery of the flagellate nature of the organism at once showed that the parasite was not a sporozoon, and that it was probably carried by an insect, so that since then practically all investigations on the transmission of leishmania have been directed towards discovering this insect. Laveran and Franchini's observations that certain flagellates which had been hitherto regarded as peculiar to insects could be inoculated into vertebrates opened up another vista, which may ultimately lead to the solution of the problem of kala-azar transmission, though it has not yet done so. It is possible that when the discovery is actually made it will be as surprising as others which have gone before. We must be careful meanwhile to keep an open mind and recognize as assumption what is assumption, for though speculation is often very useful, and without the speculative mind no progress would be made, we must never lose sight of nor fail to distinguish clearly what is actually proved.

There are many other statements made by the author in this paper which might be questioned. When he states that these insect flagellates are pathogenic to vertebrates, are we to understand that his inoculations were made in such a way as to preclude the possibility of bacterial infection? He says it is highly probable that the so-called herpetomonad stages of trypanosomes which occur in cultures have originated in scanty herpetomonad infections of the animals. We know that leishmania forms of trypanosome occur and it is not at all remarkable that the intermediate leptomonas forms should exist also. He complains that in reference to Darling's discovery of *Histoplasma capsulatum* surprisingly little attention was paid to it. I myself some years ago examined specimens of this organism most carefully and came to the conclusion that it was of the nature of a blastomycete and very like, if not indistinguishable from, the vegetable organism cryptococcus of lymphangitis of horses. I stated my opinion at a meeting of the Society of Tropical Medicine and Hygiene before Rocha-Lima's paper appeared. But having found that the histoplasma was not a protozoal organism it ceased to have any direct bearing on the question of leishmaniasis. Presumably the author still thinks it is a parasite allied to leishmania.

The observations with which his paper is mostly concerned seem to have carried the author away to such an extent that he has fallen into the error against which he warns his readers. As far as one can gather he has assumed that only one type of leishmania infection exists and that it is caused by only one insect flagellate. He complains that the experiments on which his present views are based were not undertaken before and fails to realize that the observations were not in the first place original ones of his own and that he himself at one time or another was party to many of the views which he now condemns others for having held.

Investigators are like travellers in a thirsty land attempting to discover a spring whereat they can quench their thirst. They disperse and search in various directions till finally one fortunate individual, perhaps because the road has been pointed out to him by one who had already found it, lights upon the well which saves them all. But he would be unreasonable who had the honour of this discovery if he at once criticized as foolishness the endeavours of those who had searched along the other roads, though it were only chance or possibly the guidance of another which had led him to the well himself. Still more so, if, mistaking a mirage for the object in view, he at once commenced to blame the others, on the strength of this alone, for their researches in other directions.

Cholera at Breslau.—As a case of cholera was discovered on a river boat at Breslau, the authorities have ordered all bathing and swimming establishments and bathing beaches closed. The use of unboiled water is forbidden for any purpose, even for washing clothes. Any infringement of the regulations will be punished by a prison term to a maximum of one year.

Spotted Fever.—Thirty-five cases of Rocky Mountain spotted fever with seven deaths were registered in Montana during the summer. The disease has heretofore been thought to be more prevalent in Western Montana. The report of the State Board of Health, however, shows that more cases were reported from Eastern Montana, though they were milder in character. Cultural experiments with the virus have been conducted, and although nothing definite has been determined, it is believed some progress has been made. Advances in the therapy of the diseases will, it is believed, follow the successful cultivation of the virus.

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THE JOURNAL OF

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THE CENTRALIZING OF NURSING INSTITUTES AND ASSOCIATIONS.

AT home and abroad many are perplexed to know where to get a good hospital-trained nurse, or, indeed, where to apply to get one of any kind. There is no single nursing centre or association whose name is specially known to the public. Supposing, for instance, a Government of a Crown Colony resolve to get out a number of nurses from Britain, either for temporary or permanent occupation, where would they send their letter or telegram to, or to whom would they address it? But take the case of people dwelling in England: how many know of the existence or the name of any nursing institute or association whatever? The doctor who has ordered a nurse to be brought in for a case of illness "knows of an institute," or "I think I can get one from So-and-so," naming some place where he has got one before, but of which, however, he knows nothing more than that he has the telephone number by him. How much more perplexing would it be were someone taken ill whilst travelling, say, on the Continent of Europe, and for whom a British nurse was desired; where could the voyager's companions telegraph to so as to get in touch with a nursing centre of any kind? In all probability the message would be sent to friends at home; they would be in all likelihood equally perplexed where to apply, until suddenly they would remember to ask "their own doctor," who would in turn do his best to obtain one from somewhere.

This is no exaggeration of the state of affairs in Britain to-day, and it is a position thoroughly British in its want of system and organization. Like everything of the kind it has its good points, as all "thoroughly British" things have, for as a rule they are only defective in organization, not in *personnel*. Did the trained hospital nurse know where to go or what institute or nursing association to join when she finished her training, it would solve many of her troubles. At present a nurse on leaving a hospital and "going on her own" has in too many instances a sad struggle. She may have employment for a time, but then there are intervals of want of employment between cases which may extend indefinitely.

The nurse has a room at some lodging, and the possessor of a telephone at a shop near by may for a consideration receive messages for her and send them on. The work, however, does not come in, sleepless nights follow each other, money grows yet more scarce, and her earnings disappear until her last penny is spent and she drifts into debt. This is no fanciful picture, but one all too well known to nurses and to doctors.

Surely there is some way out of this haphazard method of managing affairs which are so vitally connected with the welfare of the country? Some seek a solution in the registration of nurses, and endeavour to get the matter settled by Act of Parliament. Up to the present this movement has not been successful, and one can well understand the hesitation of the authorities to grant registration to so heterogeneous a mass of "bodies," "associations," "institutes," and "co-operative societies," "corporations," and a host of other names that make up the names of nursing communities. Who is to be the judge of a nurse? Written examination is but a test of general education, not the evidence of being a good nurse; and as each society or association, &c., exists naturally to pay its way, the nurse sent may be one of "which we do not know very much, but she ought to be all right." Fortunately she generally is all right, but it is not a good recommendation for a nurse coming to nurse one's patients or relations that "we do not know very much about her."

In hunting about for a centre for nursing I would recommend that the British Red Cross Society be selected. The name and the ideals it represents are

suitable and becoming for work of the kind. Wherever one was placed, a telegram or letter directed to the headquarters would ensure delivery, and if the Society controlled the nursing of the country the demand would be dealt with instantly. At present the Red Cross Society has no nurses of its own. When the demand comes in war it advertises for nurses in the newspapers and goes on the market as a temporary employer. We read of Red Cross nurses in our military establishments, but they are not "of" the Red Cross Society—they are merely temporary servants of that body and are granted for the time being the right to wear the Society's badge. When the war is over the nurse returns to her calling in a private nursing home, or takes a room and sets up "on her own." It will no doubt be said that the Red Cross Society cannot use its funds except for the "sick and wounded in war." This is true, but there is no need to touch that fund for such a purpose. In time of peace the Red Cross Society becomes a body without purpose. Its work could be done, when no threat of war obtains, in a single room, as it was up to the early years of this century by the "National Aid Society." It had, and even now has, no organization of doctors or nurses in time of peace, but goes into the market and obtains its *personnel* at what price it may. Recently, indeed, since war threatened, the Red Cross Society has created Voluntary Aid Detachments, both men and women, to serve as auxiliary help in time of war; but when war is over their ranks will be depleted and this excellent body of willing and well-trained workers allowed to melt away for want of any organization that can turn their energies and knowledge to useful purpose.

Were the Red Cross Society to take up the work or organizing and administering the nursing profession in Britain, centralizing it and stamping it with the name of the Society, it would be of great national benefit. It would become the body at which the registration of nurses could be set up and kept, and be responsible for the quality of the men and women on its books.

When a nurse is wanted, people in any and every part of the world would know where to apply. Centres would be established in a multitude of towns where the address, "Red Cross Society, London," or Manchester, or Glasgow, or Dublin, &c., would be all that would be needed to ensure delivery.

It is to be hoped that the Red Cross Society will take this up and not allow the work of relief in time of war to be its only function. First aid is not and should not be confined to first aid in time of war; there is a necessity for first aid in a much wider sense. Suffering is not all due to street accidents nor yet to the bullets of the enemy; and were the British Red Cross Society to organize the nursing of the country and collect under its wing the many bodies now engaged in the work, it would be a national benefit more enduring than that of relieving the sick and wounded in war, which comes at intervals so long that the very name and existence of the Society are apt to be forgotten. J. C.

Annotations.

Hunger Sickness.—O. Strauss (*Med. Klin.*, August 1) has seen a large number of cases presenting symptoms suggesting advanced heart disease and ascites plus renal dropsy. The lids are puffed up as in the severest forms of kidney disease, but the urine is free from albumin or casts and the heart findings are normal. There is also a tendency to anæmia, but the hæmoglobin percentage is within low normal range. Complicating scorbutus and Werlhof's disease are common, as also all kinds of diseases. Those presenting the above syndrome are apathetic and succumb to it in time unless treatment is promptly applied. This consists merely of proper food. With better nourishment than an exclusive potato diet and improved hygienic environment the œdema subsides and strength returns. In the regions where this syndrome is prevalent, the inhabitants for many months have had nothing to eat but potatoes, and often these have been frozen or rotten. Potatoes grown on damp soil are even less nutritious than otherwise. A one-sided potato diet is unable to protect against the dangers of inanition, and the experiences with this syndrome encountered so frequently now in Poland supply a living proof of the statements of the physiologists in regard to the danger of going below a certain minimum of albumin in the diet.

Pathology of Pernicious Anæmia (M. Barron, *Journal-Lancet*, August 15).—The blood-picture in a case of pernicious anæmia in which splenectomy was performed was studied by Barron both before and after operation. Blood examination up to five weeks before operation showed hæmoglobin about 35 per cent.; red blood cells, 2,000,000; hæmoglobin index, about 1; white blood cells, 3,500; marked anisocytosis; slight poikilocytosis; polychromatophilia and granular degeneration; practically no normoblasts, no megaloblasts; no "Howell-Jolly" bodies. The patient's condition grew progressively worse under medical treatment, and splenectomy was performed. The hæmoglobin, which was around 25 per cent. at the time of operation, rose gradually until it reached 48 per cent. fifteen weeks later. The red blood cells rose from 1,300,000 to 1,900,000. The leucocyte count soon rose to normal, and remained about normal. The shape and size of the red cells gradually improved; polychromatophilia and granular degeneration remained about the same. Normoblasts increased until at one time there were 1,400 per cubic centimetre. A few megaloblasts appeared but later disappeared. The most noticeable and pronounced change, however, was in the appearance of the "Jolly" bodies soon after the splenectomy. These nuclear remnants not only persisted, but increased to enormous numbers, in the blood. Unfortunately, a perinephritic abscess developed about three and a half months after the operation, which checked improvement. The patient died a month later.

Abstracts.

SCURVY IN MOTHER AND FŒTUS.[1]

The relation between mother and fœtus has been studied in many directions, but little attention has been paid to the effect of diets on the fœtus. With a diet of oats and water, Ingier[2] produced scurvy in pregnant guinea-pigs to determine what changes would occur in the fœtus and whether light would be thrown on certain diseases in man, such as rickets and osteomalacia.

Ingier found that pregnant animals are sensitive to this restricted diet; of thirty-three, twelve had dead litters and many mothers died with dead fœtuses in the uterus. Seventeen had their young during an early stage of the disease, and four in an advanced stage. Scorbutic changes were present in all of the fœtuses, though in widely varying degrees. The young of mothers in which scurvy developed during the latter part of pregnancy were born alive, fully developed, and with only slight bone changes. The young of mothers with scurvy during the greater part of pregnancy were nearly always born dead and showed marked evidences of scurvy, consisting of diminished bone formation, hæmorrhages in the bone marrow and fractures and even failure of bone to form. Some of these changes were more pronounced in the skeleton of the mother than in the young, which would be expected, since damage to the fœtus is often less than to the mother. During pregnancy certain nutritious substances, as glycogen and fat, pass from the mother to the fœtus. Since pregnant animals are affected more readily than non-pregnant animals by defective diet such as used in these experiments, it is probable that the fœtus may absorb, as seen in the case of glycogen and fat, a large percentage of food substances necessary to prevent scurvy, with the result that the mother is less able to combat the disease.

Recently it has been suggested that some forms of scurvy are bacterial in origin; whatever the *rôle* bacteria may play, it has long been known that an unsuitable diet may lead to the development of the disease. In connection with this, Hess has determined several new factors with respect to the lesions and signs of infantile scurvy and its relations to beriberi. Substances that prevent scurvy are present in vegetables and fresh fruit, but just what these are has not been determined. It is thought that they act either directly on the bone-forming elements or on the secretion of internal glands. Insufficiency of a gland of internal secretion in the mother may cause hypertrophy of the same gland in the fœtus—for example, the thyroid—and Ingier added various preparations of internal glands which influence bone growth (hypophysis, thymus, parathyroid, and thyroid) to the oats and water diet to see if the scurvy could be prevented; but the results were entirely negative. Defibrinated blood from normal guinea-pigs, which we may assume would contain secretions of all of the internal glands, was also without effect when given to animals with scurvy.

A diet deficient in phosphates produced a disease in dogs which resembles, but which probably is not, scurvy. Ingier added phosphated cod-liver oil to the oats-water diet, but this did not check the development of scurvy or alter its course after it had developed, the result indicating that phosphates are not the substances essential for the prevention of scurvy.

The experiments here reviewed briefly do not speak for an etiologic relationship between scurvy and the congenital disease known as osteogenesis imperfecta. This disease, though due to a diminution of osseous development, differs essentially from scurvy and has not been produced by the feeding experiments. There are also fundamental differences between scurvy and rickets and osteomalacia. Scurvy and osteomalacia may occur in pregnancy, and exacerbations of existing osteomalacia may develop during pregnancy, but it is doubtful if the offspring of such mothers have the disease at birth. In these conditions, the fœtus apparently through a selective action of the placenta is able to avoid the factors that are injurious to the mother. Disturbance of ductless glands secretion seems to play a *rôle* here; in osteomalacia the parathyroids seem to be concerned.

In conclusion, it may be said that, while Ingier did not succeed in finding the specific substances necessary to prevent scurvy, she did succeed in transmitting the disease from mother to offspring.

[1] Abstracted from editorial, *Journ. Amer. Med. Assoc.*, September 18, 1915.

[2] Ingier, Alexandra: "A Study of Barlow's Disease experimentally produced in Fœtal and Newborn Guinea-pigs," *Journ. Exper. Med.*, 1915, xxi, p. 525.

PARASITES FOUND IN PRISONERS AT BILIBID PRISON.[1]

All prisoners before being admitted into Bilibid are placed in quarantine and treated for intestinal parasites until they are twice negative microscopically. Upon a recent examination which was made of prisoners, the following results were obtained:—

Stool examinations at Bilibid Hospital from July 1, 1913, to December 31, 1913: Amœba, 144; ascaris, 631; *Balantidium coli*, 3; hookworm, 392; monads, 202; oxyuris, 36; strongyloides, 11; tænia, 2; trichuris, 869. Total number of prisoners examined, 2,416; total positive for intestinal parasites, 2,290; percentage positive, 94.

The foregoing shows that either the treatment upon entrance into the prison was not effective, or that the prisoners became reinfected after they entered that institution. It is difficult to understand how they could become reinfected, because

[1] Report of the Bureau of Health for the Philippine Islands, July to December, 1913.

they use only boiled water, no raw vegetables are served, and they do not work where they could become infected through contaminated soil. The disposal of excreta in Bilibid is by means of modern flush closets.

During the preceding year a general survey for filaria was made of all prisoners confined in Bilibid. More than 5,000 blood examinations were made, each prisoner's blood being examined twice, with the result that 297 prisoners (10·5 per cent.) were found infected with filaria. During the past six months all prisoners have been re-examined, making an additional 5,000 examinations, or a total of approximately 10,000 blood examinations for filaria alone. The second survey resulted in the discovery of six additional cases from among those reported negative on first examination. As these prisoners were mostly from known infected provinces, they probably carried the infection at the time of their first examination, though no micro-filaria appeared in the blood specimen taken at that time. In addition to the survey work on prisoners in Bilibid, all new arrivals have been examined as they came in, with the result that we have seventy-three (0·039 per cent.) new cases of filaria to report from among those examined. Out of all this number of filaria cases only one, a Negrito from Negros, has shown any indication of pathological results due to the filaria. This man was suffering from elephantiasis of the scrotum. The total number of filaria cases discovered to date is 370, of which 278 remained in Bilibid December 31, 1913.

MALARIA AND SINUS THROMBOSIS.[1]

By H. B. Graham.

Probably the most frequent mistake in diagnosis is that of malaria, on account of the similarity of the temperature curve. Urbantschitsch[2] has collected six cases in the literature with simultaneous occurrence of otitis media and malaria; in each case the symptoms were taken for those of sinus thrombosis.

Urbantschitsch's case was that of a 14-year-old girl with acute mastoiditis, operated February 29, at a time when the fever was 37° to 38° C. (98·6° to 100·4° F.), exhibiting no signs of any complication. A sinus thrombosis was discovered at operation and removed. The patient recovered perfectly, leaving the clinic on April 2 and returning June 1, complaining of ringing in the ear, lessened hearing and a reopened perforation with a small amount of pus in the canal. The appetite was poor and the patient weak. On June 16 the temperature was 39° C. On the 18th, 20th and 22nd there were chills; plasmodia were discovered on the 23rd. In this case there was no splenic enlargement.

The author reports a case of malaria which did not end so fortunately:—

G., aged 50, an American tanner, was seen August 17, 1914. The patient lived in Los Angeles until ten months ago, when he began work on the Sacramento River. Eight years ago he had typhoid; erysipelas two years ago; he had had no acute rheumatism; no malaria. About two years ago he had an attack of chills and fever associated with pain in the lumbar region, lasting about one week. He has been deaf in the left ear since the attack of typhoid. The patient came to the clinic on August 17, complaining of tinnitus, pain over the ear and of a previous discharge from the left ear. He said that two months previously he had suddenly had a feeling as though an insect had entered the canal; there had been pain but no nausea, vomiting or vertigo; after ten days there was a watery discharge which later became thick and purulent. On examination the temperature was found to be 99·8° F. There was some tenderness over the mastoid. The drum was thick, swollen, dull red, and gave the impression one finds in *Streptococcus mucosus* infection after three weeks. A paracentesis gave a mucoid secretion after politzerization. The patient complained of a heavy, dull, full feeling in the head, not an ache, and a clinical diagnosis of a capsulated bacterial invasion of the middle ear with meningeal irritation was made, and the patient sent to the hospital for operation.

At operation the mastoid was found to be made up of many cells containing a thick red mucous membrane and much blood-tinged mucus. The sinus was uncovered and was found to be clean and well filled. The secretion contained few pus cells, few red blood cells, no bacteria as shown in the slides. In the culture tubes a few isolated small colonies of streptococci were found which were considered to be a contamination. August 21: Blood count: white cells, 6,600; polymorphonuclears, 69; lymphocytes, 21; large mononuclears, 6; eosinophiles, 2·5; basophiles, 5; transitionals, 5:200 counted. No plasmodia were found. On the 18th, 20th and 22nd there were rises of temperature to 103° F. and on the 22nd a chill. On the 22nd a search of one hour was made in specimens taken one hour after a paroxysm and no plasmodia were found. On the 21st, Dr. Dickson found some tenderness along the descending colon. The liver and spleen were not palpable. On the 20th, the cerebrospinal fluid was normal in cell count bacteriologically and chemically. On the 24th, diazoreaction was negative. On the 24th, the right eye ground was normal. The left showed a diffuse œdema of the disc, edges blurred and indistinct, veins swollen. Diagnosis by Dr. Barkan was of fresh neuritis opticus. There was some nystagmus to the right.

It was decided on account of the chill, the eye findings, and the negative findings for typhoid and malaria, to open the sinus. The dura of the middle and posterior fossæ were uncovered and both found clean. The sinus was opened and found normal. Following the operation the mentality of the patient became clouded and the knee-jerks were lessened. No stiffness of the head and no Kernig was noted. On the 26th the Widal test was negative. On the 28th the blood was found to be filled with *Plasmodia*

[1] Abstracted from *Journ. Amer. Med. Assoc.*, September 4, 1915.
[2] Urbantschitsch, E.; *Monatschr. f. Ohrenh.*, 1909, p. 29.

malariæ (the ring forms of the æstivo-autumnal type). The cerebrospinal fluid showed no bacteria but contained many red blood corpuscles mostly containing ring forms of plasmodia. The patient died on the 28th. The necropsy showed a somewhat enlarged spleen 125 by 95 by 5 mm., an otitis media acuta, malarial septicæmia. Smears from the cerebellum and cerebrum showed the majority of the red blood cells in the capillaries containing fully developed small parasites with much pigment; few rosettes, few small soquet rings, sometimes occurring in the same corpuscle with the large forms. Several large phagocytes full of black pigment were noted. The marrow and spleen contained many pigmented cells, a moderate number of fully developed malarial parasites in the reds. The adrenals contained mostly young forms. The middle ear showed many polynuclear leucocytes, many small diplococci and short chains.

The occurrence of an acute discharge from the ear due to the presence of the plasmodia is unknown, according to a personal communication from Captain Craig, United States Army. The fact that no bacteria were found in the secretion from the wound at the time of the operation is extremely interesting, and would lead one to suspect that the plasmodium could produce such discharges were it not that a few streptococci were found in the middle ear at necropsy. Still these may have been introduced subsequent to the operation. That the plasmodia were not observed in the peripheral circulation after careful search does not mean that they were overlooked, as others have observed the phenomenon of late appearance in cases with the æstivo-autumnal varieties. Dr. Gellineck, of San Francisco, has observed such a case, in which repeated careful search was made with negative result, and suddenly the peripheral circulation became literally filled with the organism.

Not any less interesting or important in our differential diagnosis is the fever-producing abdominal syphilis, which progresses with a picture that is typical of malaria or sepsis. This interesting disease has been studied by Mannaberg,[1] Gehrhardt,[2] and others, and occurs far more frequently than was formerly suspected. The fever may be preceded by a marked chill and rise of temperature to 104° F. each day, persisting for months, as Mannaberg reports in one of his cases of hereditary syphilis. The presence of this affection, together with mastoiditis or chronic suppurative otitis, is not to be belittled, for in this day of the radical operation many cases of syphilis of the ear come to operation. Downing[3] describes a case in which he had operated for an acute mastoiditis, in which seventeen days later the patient developed a temperature of 102° F. daily, preceded by a chill. Quinine was used in spite of a negative examination for malaria, without result. The leucocyte count was 6,000, and the patient did not appear septic. Salvarsan was administered on the fifteenth day of the chills with an immediate cessation of all symptoms.

[1] Mannaberg, *Zeitschr. f. klin. Med.*, 1907, lxii p. 253.
[2] Gehrhardt, *Berl. klin. Wochenschr.*, 1900, p. 1046.
[3] Downing, *Ann. Otol., Rhin. and Laryngol.*, 1912, p. 1044.

Discussion.

C. F. Welty: Cases of malaria mixed up with a discharging ear are indeed difficult of correct diagnosis. If it is a case of sinus thrombosis, so much valuable time is lost in bacteriologic work that the patient grows profoundly more septic, chances of recovery are much lessened and many things may happen. This case recalls a case reported by Dr. Hastings, of Los Angeles. In this case the bacteriologist made a positive finding of malaria. Further examination several days afterwards gave a negative finding for malaria. Then the patient was operated on and died in a short time. I relate this case as it has a bearing on what I have to say in connection with malaria and sinus thrombosis. I feel it much safer for the patient to make an incision of the sinus so one can speak in definite terms as to what one has to accomplish. There is a near possibility of having malaria and sinus thrombosis in the same individual that must always be borne in mind.

Medical Notes.

MOBILE LABORATORIES WITH THE BRITISH ARMY IN FRANCE.

As showing the completeness of the medical department of the British Army in France, the presence of mobile laboratories is not the least. There are many of these at the immediate front where, by observation and investigation, they are intended to help to lessen disease, whether conveyed by air, food, water, or by contagion. Useful work has been done in determining the presence of carriers of enteric by examination of the urine, in the diagnosis and treatment of cerebro-spinal meningitis, and in inoculations against typhoid and in dealing with the whole range of possible zymotic diseases. The results of the work may be gauged by the extraordinarily low level at which infectious and contagious diseases has been kept.

Cooks, waiters, and employees of hotels and restaurants will be subjected to medical inspection by the corps of medical inspectors of the Philadelphia Bureau of Health as quickly as the work can be carried out, to enforce the provisions of the Act prohibiting the employment in public places of cooks, waiting maids, kitchen help, chambermaids or other house servants who suffer from contagious disease. The Act calls for the protection of public health and was a salutary measure that should appeal to employers. The Act embraces not only hotels and restaurants, but dining cars and all public eating places.

Original Communications.

NOTES ON CERTAIN INSECTICIDES.

By Aldo Castellani, M.D.
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AND
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In the present note we propose to give briefly the result of certain experiments we have carried out to determine the efficacy or worthlessness of substances used as insecticides.

The subject is of some practical importance in view of the fact that Serbia, the place of our observations, has recently been ravaged by two diseases carried by lice, viz., typhus exanthematicus and relapsing fever.

Technique.—We have carried out our experiments of testing the efficacy of substances and gases principally against body-lice (*Pediculus corporis* de Geer 1778), but also on a smaller scale against bed-bugs (*Clinocoris lectularius* L. 1758), fleas (*Pulex irritans* L. 1758), head-lice (*Pediculus humanus* L. 1758), and crab-lice (*Phthirius pubis* L. 1758). All of the insects were obtained from the bodies and clothing of clinic and hospital patients.

The technique for solids was as follows: Small tin boxes with loose-fitting lids, easily removable, were used. In these boxes were placed the substances to be tested and the living lice or bed-bugs. In the case of fleas, small transparent glass dishes, resembling Petri dishes, were used, as the tin boxes were found unsuitable, the fleas jumping out of them upon opening. Every few minutes the insects in the boxes or glass vessels were inspected and the degree of activity or the death of the insects was noted, with the elapsed time of exposure. The experiments were all carefully controlled. The controls lived for days, more than six days, and were entirely unaffected by simple captivity, so far as could be observed.

Sulphur.—The use of sulphur as an insecticide is a very old practice. It is said to have been used by the ancients for that purpose. By many authorities it is considered to be very efficacious against body-lice, and it is one of the substances most generally recommended by dermatologists. Specimens of body-lice, crab-lice, bed-bugs, and fleas were placed by us in boxes containing powdered sulphur and found alive and apparently unaffected forty-eight hours later.

We concluded that precipitated sulphur in powdered form has no deleterious effect whatever upon body-lice, crab-lice, bed-bugs, and fleas under ordinary circumstances. It is stated by certain authorities that sulphur in contact with the fatty substances in the sweat undergoes reduction, with the formation of small quantities of H_2S. Accordingly living lice were placed in tin boxes containing precipitated sulphur mixed with sebaceous human secretion obtained by scraping the faces of patients affected with seborrhœa oleosa. These lice remained alive forty-eight hours after being placed in the boxes, apparently unaffected.

Mercury Preparations.—Calomel in powder form does not seem to have very great influence upon these ectoparasites, according to our observations. Lice, fleas, and bed-bugs were found alive after forty-eight hours of contact under conditions already described. In the form of ointment calomel is, on the other hand, efficacious, but, as we will presently show, vaseline, lard, and lanoline are efficacious insecticides without any added medicaments.

We obtained similar results with the other mercurial preparations in powdered form, viz., mercury bichloride, ammoniated mercury, and the red and yellow oxides of mercury. In our opinion they have little or no efficacy as insecticides in powder form.

Arsenic.—Powdered arsenious acid failed to kill lice in twenty-four hours. Experiments on bed-bugs and fleas were not carried out.

Salicylic Acid.—Salicylic acid in powder form has no very destructive action upon body-lice or bed-bugs. We have performed no experiments with head-lice and fleas. Body-lice and bed-bugs were found to be alive at the end of twenty hours of contact, *i.e.*, after twenty hours' confinement in the small tin box containing powdered salicylic acid.

Boric Acid.—This substance seems to have no deleterious effect whatever upon lice, so far as our observations are indicative. The lice in the boxes containing boric acid lived as long as the controls placed in boxes containing no boric acid, viz., seven days.

Zinc Sulphate.—This substance in powder form has no deleterious effect upon body-lice under the conditions described, according to our observation. Its effect upon other ectoparasites was not studied.

Iodoform.—Body-lice showed signs of intoxication after ten minutes' exposure and died within thirty to forty minutes. Bed-bugs, on the other hand, were little affected by iodoform, remaining quite lively for twelve to fifteen hours, after which time they presented signs of intoxication. Fleas were quite lively after ten hours.

Camphor.—Body-lice remained alive from three to six hours. No experiments with other parasites were carried out with camphor.

B-naphthol.—Body-lice died in from one or two hours' exposure. Bed-bugs remained alive for more than fifteen hours.

Naphthaline.—Body-lice showed signs of being affected ten to twenty minutes after being placed in the boxes containing naphthaline, but none was dead until from one to three hours later.

Naphthaline seems to be fairly efficacious against fleas; they were found dead within thirty to sixty minutes after exposure. Bed-bugs remained quite lively for two to three hours, then showed signs of intoxication and were found dead within twelve to fifteen hours. If naphthaline is mixed with zinc oxide its efficacy is much lessened.

Pyrethrum.—This is probably the most widely

used insecticide, and is found in practically all patent insect powders. According to our experiments, its efficacy on lice does not correspond with the reputation it popularly bears. We have found it to have a very feeble action on body-lice, which were only found dead after twelve to twenty-four hours' exposure in the boxes described above. It has a much more destructive effect upon bed-bugs, as indicated by our experiments, the bed-bugs showing signs of being affected within three or four hours, and dying within five to eight hours.

Unguent. Staphisagriæ (*B.P.*).—This is efficacious against lice, but we have found out that vaseline, lanoline, lard, &c., are good insecticides without addition of any drug.

Menthol.—We have found this drug to be a powerful insecticide in regard to lice and fleas, while it is not so efficacious for bed-bugs. For practical use we mix it with zinc oxide in the proportion of 1 to 3 to 100 parts of zinc oxide. Body-lice placed in boxes containing such menthol powder die within forty-five to sixty minutes. Fleas die within thirty minutes. Bed-bugs show signs of intoxication one to two hours after exposure, but remain alive for fifteen or twenty hours. The following formulæ will be found useful: Menthol, gr. v-x; zinci ox. ad ℥i. Menthol, gr. v-x; pyrethrum, gr. xxx-ʒj; zinci ox., ʒij; talci ad ℥j.

Kerosene Oil.—In our experience this is probably the most powerful licecide substance with which we have experimented. It practically kills body-lice instantaneously. While extremely useful for destroying lice and other vermin in houses, furniture, &c., it is not used extensively on the skins of affected people owing to its disagreeable odour. Benzine (or gasoline) has a somewhat less objectionable odour and is quite as effective as kerosene. In our wholesale disinfection of troops and prisoners in Serbia, however, we made use of kerosene daily, applied to naked men after bathing by means of a spray pump, or applied directly with cloths or cotton-wool. No bad effects were noted and very little dermatitis was excited, contrary to our fears.

Guaiacol.—Guaiacol is a very powerful insecticide. We have used it mixed with zinc oxide in the proportion of 2 to 100. This powder is very efficient against body-lice, which die within ten to fifteen minutes. Fleas were also quickly killed. It is also an extremely good powder for use against bed-bugs. These vermin die within thirty to sixty minutes of exposure in the boxes described. The smell of guaiacol is, however, objectionable to many people, and this fact detracts from its usefulness.

Anise Preparations (Onethol, Anisette, &c.).—These are very good insecticides. They can be made up in powder form with zinc oxide, 1 or 2 per cent. being used, or they may be used in alcoholic solution or in ointment form. Our experiments were mostly made with onethol mixed with zinc oxide in the proportion of 1 to 50. Body-lice in boxes containing this powder die in from thirty to sixty minutes. No tests were made with crab-lice or head-lice. Fleas die in from ten to twenty minutes. Bed-bugs die within from two to six hours.

Citronella Oil.—The interiors of boxes were smeared with oil of citronella; lice exposed in these boxes died within one to three hours, and bed-bugs lived but little longer, dying within two to four hours. Citronella oil, as is well known, is repellent also to mosquitoes and flies.

Eucalyptus Oil.—Eucalyptus oil, as well as other oils possessing a strong odour, are efficacious licecides.

Carbolic Acid.—Lice were killed within fifteen to twenty minutes when a 5 per cent. solution was used. No experiments were made with bed-bugs.

Lysol.—Lysol and similar preparations (cyllin, &c.) are powerful licecides.

Glycerine.—Glycerine has very little insecticide action.

Ol. Terebinthinæ.—This is a good licecide, but in Serbia it is difficult to obtain and is very expensive.

Vaseline.—Lice and fleas plunged in a little vaseline die an instantaneous death, practically speaking. Bed-bugs die within from one to three minutes. This observation may be of some interest, and raises the question whether or not the sulphur and mercurial salts present in ointments generally used for killing body-lice and head-lice are superfluous and occasionally harmful, owing to the dermatitis which they occasionally induce. The action of lard and lanoline is similar to that of vaseline.

Gaseous Insecticides.—In the matter of gaseous insecticides our observations were confined to the results of actual practice, daily and abundant opportunity being afforded by the extensive cleaning and disinfectant operations of the American Red Cross Sanitary Commission. Here, as well as in our laboratory observations, lice and bed-bugs were the principal insects dealt with. Steam, hot air and sulphur fumes were the only gases employed in practice, and are therefore the only ones upon which we offer any report.

Steam.—No observations were made concerning the insecticide action of steam against bed-bugs, but a large number of observations were made as to the effect of steam upon lice. Briefly, it kills both insects and eggs under proper conditions of exposure in a very few minutes. Thirty (30) living lice were loosely tied in a handkerchief, placed in the pocket of a woollen overcoat and hung upon the wall of a steam car. They were found dead after ten minutes' exposure to live steam, and the eggs were found to be thoroughly cooked. No pressure was used, the steam car being an ordinary lined refrigerator railway car into which steam was piped. On the other hand, lice upon woollen clothing survived steam under moderate pressure (autoclave) when tightly tied up in bundles, the steam failing to penetrate. The entire question of technique in steam disinfection is one of penetration and exposure. The same failure was noted in hot-air furnaces when woollen clothes were tied up tightly in bundles or were piled in heavy masses preventing the penetration of both steam and hot air. The loss of the characteristic glossy colour of the lice eggs is evidence of their death. If failure results from steam disinfection (insecticide action) the cause lies in a faulty technique.

Clothing must be loosely piled or hung up in

steam chambers to permit the necessary penetration and exposure. Suitable pressure to secure penetration of woollen clothing cannot be secured or expected in the ordinary portable steam sterilizer, but perfectly satisfactory results may be expected if the clothing, blankets, &c., under treatment by steam are loosely arranged or hung up.

Sulphur Fumes.—The insecticide action of the fumes of burning sulphur is satisfactory so far as lice and bed-bugs are concerned if the proper technique be employed. The necessary conditions are proper confinement of the sulphur fumes by rendering the chamber or room approximately airtight (pasting up all openings with paper), the burning of a sufficient amount of sulphur (depending upon the degree of airtightness obtainable), and the maintainance of prolonged exposure in a sealed room. These are matters of technique requiring expert knowledge and practical skill, which the Sanitary Commission was fortunately able to command. Unfortunately, sulphur fumigation cannot be depended upon to kill the eggs of bed-bugs and lice, although it is highly effective against the insects themselves. Accordingly, repeated fumigation (to destroy the young broods) is necessary at intervals of a week or ten days, two fumigations ordinarily completing the task. This is an important matter to be remembered, especially in the destruction of vermin in hospitals.

Remarks and Conclusions.

(1) In regard to solid and liquid insecticides, the substances which we have found to be deleterious to body-lice (*Pediculus corporis* de Geer 1778) are, in the order of their efficiency: Kerosene oil, vaseline, guaiacol, anise preparations, iodoform, lysol, cyllin and similar preparations, carbolic acid solution, napthaline, camphor.

Pyrethrum has a very feeble action on lice, while boric acid, sulphur, corrosive sublimate, and zinc sulphate, when used in powder form, have apparently no action whatever. As regards bed-bugs, kerosene oil is the best insecticide. Next to it comes guaiacol, one of the most active drugs of those we have tried.

(2) Substances which are powerful licecides may have very little or no action upon bed-bugs, and *vice versa*. For instance, iodoform which kills lice within ten to fifteen minutes has practically no deleterious action on bed-bugs, which may live for more than twenty-four hours when exposed to it. It has also very little effect on fleas. Pyrethrum, on the other hand, has a much more powerful action on bed-bugs than on lice.

(3) For use against lice on a large scale, as among troops and prisoners, perhaps the best insecticide powder is naphthaline. This substance has a lower licecide action than kerosene oil, guaiacol, iodoform and anise preparations, such as onethol, but it has a less displeasing odour than the first three named, and is much cheaper than onethol powder. In stored blankets and clothing it is also practicable and of use, as frequently lice are found upon the clothing and blankets stored through the summer. Naphthaline is useful also for its well-known deterrent action upon moths. We are speaking here of insecticide powders. As regards liquid insecticides, the American Red Cross Sanitary Commission gave sanction to kerosene by its daily use upon troops and prisoners.

(4) For the better class of patients in practice a menthol powder is to be preferred to napthaline in most cases, as its odour is not displeasing, while it is repellent to mosquitoes, in addition to lice and fleas. Such powder is especially useful in summer and in hot countries, as it has a cooling effect on the skin and often prevents prickly heat.

INOCULATION OF SMALL-POX AS A PROPHYLACTIC MEASURE AS PRACTISED BY THE NATIVES AT DJEN IN NIGERIA.

By H. Andrew Foy, D.P.H.

Sanitary Officer, West African Medical Staff, Nigeria.

Djen is a very large pagan settlement on the right bank of the Benue, some thirty miles above Lau, in the Northern Provinces of Nigeria. This settlement consists of three large towns, which are about two to three miles apart, and each has a good flourishing population. The three towns are as follows:—

(1) Djen Saratunde, where the Seriki, or chief, resides.

(2) Djen Sarazaka, situated a bit inland from the river.

(3) Djen Saradow, the largest, is up river to Djen Saratunde.

Each of these towns consists of ten to twelve sections, in which the houses are closely clumped together on a limited elevation, around which the ground gets flooded in the wet season. Under these circumstances infection of any disease such as small-pox rapidly spreads amongst the dense population.

Population of Djen.

The approximate estimate of the population is as follows: Males, 1,200, females, 1,500, and children, 2,000; making a total of 4,700.

Arriving at Djen on February 6, 1915, I found small-pox prevalent amongst the whole population. On inquiry it was ascertained that small-pox had now been prevalent for five months, and that the infection was brought in October, 1914, from a town called Bolere, which is near Bamuka. The disease first began in Djen Sarazaka, from whence it spread to Djen Saradow, and subsequently to Djen Saratunde. The mortality from the disease during the last five months was estimated at 100 in each of the three towns. At the onset of the outbreak of the disease the people adopted preventive measures by segregating the sick across the river, but when the infection became general they ceased to do so.

The chief of the whole of Djen lives in Djen Saratunde, and is a very intelligent man. The section occupied by the Chief's household is a comparatively small one, with a total population of

84 (males, females, and children), and of these four had already contracted the disease, two of whom had the confluent form of the disease and were treated with salol, one of these two being the chief's daughter, a girl of about 8. Both made a recovery, as was seen by me on March 27, when I visited Djen on my return journey, and followed up statistics already acquired on my way up river to Yola.

As the disease had now taken a hold on the population of Djen Saratunde and the mortality continued high, the chief of Djen, Nana by name, decided to resort to inoculation of the disease as a prophylactic measure. He therefore inoculated all those men, women and children who lived in Djen Saratunde that had not had the disease before and had not been inoculated at any time previously. On arrival here I therefore found that a very large proportion of the people had been inoculated with small-pox nine days previously. As I had the good fortune to arrive here on the ninth day after inoculation, I was led to investigate the method of inoculation and the results of such inoculation with the virus direct. The latter have been collated from my observations made now and subsequently on my return here very nearly two months later, and they will be seen later in concise statistical form.

Before proceeding to describe the native method of inoculation and the results observed it would be well for me to draw attention to the extreme utility —in fact, I might almost say specific effect—of the use of salol in the treatment of small-pox. If treatment by salol, 10 gr., three times a day, is begun within the first two or three days after the eruption appears it has the remarkable effect of lowering the temperature, the intensity of the suppurative phase is much modified, the pitting is much less marked, and the recovery is comparatively rapid. Carbolic oil (1 in 40) is applied daily to the eruption on the skin. This treatment is both simple and effective. The method of inoculation is interesting, and although we know that it has been practised in this country for ages little was known as to the details of the process and still less have we any accurate statistics of results of such inoculation.

The Process of Inoculation.

Seat of Inoculation.—This is on the extensor surface about 3½ in. above the wrist in adults. In males it is done on the left forearm, as the right hand is the strong or working hand, whereas in women it is done on the right forearm as the left hand is considered the working hand and most useful. Age is no bar to inoculation, for many babies 1 to 6 months of age had been inoculated.

Virus used for Inoculation.—Lymph is taken from the pustules of a case of discrete small-pox on the ninth day of the disease in a young person. Here the lymph was taken from a girl of about 10 years of age, who had large discrete pustules, although the whole body was fairly well covered with the eruption.

Method of Inoculation.—The operator sits with the person to be inoculated before him, the case of small-pox from which lymph is to be taken is on one side, and on the other he has a bowl of maize grains and another bowl of honey. An incision from half to three-quarters of an inch in length is made through the skin with a razor, a pustule in the patient is opened, and with the end of a straw some of the lymph is applied to the incision made with the razor. The operator then places a grain of maize into the mouth of the person inoculated and with the end of a fresh straw dipped in the honey he places a drop of honey on the tongue of the individual and subsequently a drop of honey is applied to the seat of inoculation. The reason for this accessory part of the process of inoculation is as follows: The grain of maize is placed in the mouth of the inoculated person in the belief that when he develops small-pox the vesicles will be large and discrete; the drop of honey is placed on the tongue so that the eruption may come out quickly and contents of the vesicles will be clear like honey in the comb. The two objects in view are certainly both very desirable in a case that develops small-pox after inoculation, but not necessarily achieved; still it is interesting that these people should understand the signs in an eruption that constitute a discrete or favourable case, and they have acquired a knowledge as to the advisability of using the lymph from a discrete case of small-pox for inoculating others.

Results of Inoculation.—To ascertain these accurately I limited my observations to the section occupied by the chief, his family and retinue, and the results have been carefully tabulated with a summary of the chief points of interest. They are as follows:—

In another set of observations made on twenty-four inoculated persons (male, female and children) the local reaction was *good* in 11, *poor* in 8, and *nil* in 5. Thus the total number of reactions were 19 out of 24 inoculated, or 79·1 per cent.

One case in the above developed the general eruption on the ninth day after inoculation.

Summary.

The points of interest from the foregoing statistics are:—

(*a*) 80 per cent. of a mixed population (male, female, and children) inoculated with the virus of small-pox from a case of discrete small-pox developed a local reaction, the comparative percentage so far as adults and children go being fairly equal.

(*b*) 43·3 per cent. of those inoculated (mixed population) developed small-pox; adults 30·9 per cent. and children 48·7 per cent.

(*c*) 53 per cent. of those that showed a local reaction at seat of inoculation developed small-pox.

(*d*) 38·8 per cent. adults (male and female) and 48·7 per cent. children out of (*c*) developed small-pox.

(*e*) Both from (*b*) and (*d*) the figures show a much higher degree of susceptibility of children as compared with adults when inoculated with the disease.

(*f*) *The mortality in twenty-six cases* that developed the disease out of sixty inoculated was *nil;*

STATISTICS OF THE RESULTS OF INOCULATION WITH SMALL POX AS A PROPHYLACTIC MEASURE CARRIED OUT BY THE NATIVES AT DJEN, ON THE BENUE, IN NIGERIA, WEST AFRICA.

Total population in the Serikis Unowa at Djen — Sex	Number	Number had small-pox or previously inoculated	Number inoculated with small-pox	Local reaction as a result of inoculation with small-pox seen on the ninth day after inoculation: Good local reaction (1)	Poor local reaction (2)	Total with local reaction	Local reaction *nil* (3)	Percentage of inoculated that developed a local reaction	Total number of those inoculated that developed small-pox	Percentage of those inoculated that developed small-pox	Percentage of those with local reaction after inoculation that developed small-pox	Number of deaths	Incubation period is shorter after inoculation than in case of natural infection
Males ..	14	7	7	3	3	6	1	85·7	2	28·5	33·3	*Nil*	In two cases out of (1) eruption out on 9th day
Females ..	24	12	12	6	3	9	3	75·0	4	33·3	44·4	*Nil*	
Children ..	42	1	41	25	9	34	7	83·0	20	48·7	58·8	*Nil*	
Total ..	80	20	60	34	15	49	11	81·5	26	43·3	53·0	*Nil*	

mortality, however, occurred amongst other inoculated cases, but it was not possible to get definite figures of mortality relative to the number inoculated and to the number that developed a local reaction.

(*g*) *Incubation Period of Infection naturally acquired is Eleven Days.*—In three inoculated cases the *eruption appeared on the ninth day after* inoculation, so that the *disease began on the seventh day* and incubation period is shortened as a result of inoculation.

(*h*) *Nature of Attack resulting from Inoculation.*—Of the twenty-six cases that developed small-pox six were badly marked, showing a fairly acute attack of discrete small-pox, the remaining twenty had slight marking as an indication of a mild attack.

SCHISTOSOMIASIS IN NATAL.

By F. G. Cawston, M.B., B.C.Cantab.

The life-history of the human Schistosoma was first demonstrated in a brilliant manner by the Japanese (Miyairi and Suzuki), who, in September, 1913, proved that the miracidium escaping from the egg in water entered the snail and there, after the development of a sporocyst, produced cercariæ, which were able to penetrate the skin of mice and give rise to characteristic schistosome infection. These observations were confirmed by Leiper and Atkinson in China and Japan in 1914, and it was this which led me to undertake similar experiments in South Africa during May and June of this year. On my return to England now, I have just ascertained that Leiper has been successful in again demonstrating this cycle in Egypt. It is not clear from his description whether his experiments were conducted with lateral- or terminal-spined eggs, whereas my experiments in Natal were conducted exclusively with terminal-spined eggs.

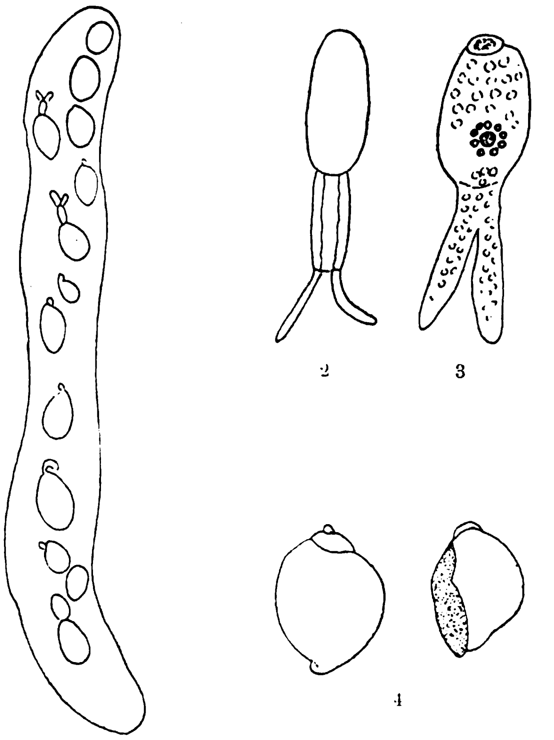
Estimates vary as to the frequency with which cases of schistosomiasis are met with in Natal; but the opinion is unanimously held amongst practitioners that the affection is caused as the result of bathing in infected streams and pools. Reeds are common in these places and, in May last, I carried out some experiments with the assistance of Dr. Warren, the Director of the Natal Government Museum, on the snails which abound in the bathing places. I was told that the affection was not found in lads who bathed at the mouth of the Natal rivers, and was interested to find fresh-water snails absent from the reeds within a few miles of the coast. This I attributed to the presence of a varying degree of salt water and it might account for the absence of infection there.

On May 10 I collected a number of snails from a popular bathing place near Pietermaritzburg (*Limnæa natalensis*), but failed to procure any positive results from my experiments, though a sporocyst containing cercaria with an undivided tail was found in the liver of one of them. Early in June, however, Dr. Warren reported that he had found some undoubted cercariæ in some of the snails (*Physopsis africana*), which he had exposed to infection by miracidia supplied to him by me four weeks previously. These miracidia were hatched out of eggs which were characterized by a terminal spine; lateral-spined eggs do not occur, as far as I am aware, in the locality in which these experiments were conducted. The cercariæ possessed two suckers and a bifid tail, but showed no indication of a pharynx. They were contained in a well-marked sporocyst. The evidence is not absolutely conclusive that these cercariæ were present as a result of their exposure to infection by miracidia; but, in view of the recent work done by Leiper in Egypt, the inference is allowable. In October I visited a small bathing pool near Durban, where a large proportion of the lads who bathed there were said to be infected with schistosomiasis, and found both forms of snails abounding on the reeds, but I had no opportunity of making microscopic examinations at the time. This observation lends emphasis to the theory that *Physopsis africana* may act as an intermediate host to Schistosoma in Natal.

Dr. Warren kindly allowed me to have the washings from the snails he had exposed to infection, and I washed a guinea-pig and a mouse in them for half-an-hour a day for three days. The mouse escaped before the experiments were completed; the guinea-pig died at the end of six weeks. No bilharzia worms were seen in the blood-vessels *post mortem*, but there was a good deal of free fluid in the peritoneal cavity of the guinea-pig which pointed to hepatic congestion.

At the same time I drew the attention of t

municipal authorities at Pietermaritzburg to the possible cause of infection and was instrumental in securing the removal of decomposing reeds from the popular bathing pool referred to.



(1) Cercariæ developing in sporocyst found in liver of *Physopsis africana* in June, after having been exposed to miracidia escaping from terminal-spined eggs passed in urine in May.
(2) Outline drawing of living cercaria.
(3) Appearance of cercaria when fixed and stained, showing two suckers and absence of pharynx.
(4) *Physopsis africana*, natural size.

It is interesting to note the marked similarity of the cercariæ and sporocyst discovered in the liver of the snail (*Physopsis africana*), which had been exposed to possible infection from a Natal patient in May, 1915, and those described by Leiper and Atkinson in the report of their experiments with the Asiatic form of the disease.

My experiments were described by Dr. Watkins-Pitchford in the July number of the *Medical Journal of South Africa* for this year.

A CASE OF ORIENTAL SORE TREATED BY ANTIMONIUM TARTARATUM (TARTAR EMETIC) LOCALLY.

By George C. Low, M.A., M.D.

Assistant Physician, Seamen's Hospital, Albert Docks, E.; Lecturer, London School of Tropical Medicine, &c.

History of Case.—April 7, 1915. Miss H., aged 33. India.

History.—Only been in India one year and nine months. All that time in Lahore in the Punjab. In the autumn of 1914 strained her heart and was sent home to England in consequence. Also suffering from bad varicose veins in both legs.

Present Illness.—In January, 1914, after a little over a year's stay in India, two small sores appeared, one on forehead, the other on left side of face. These were scraped at once, but this did not cure them, as after that they began to get bigger and spread in circumference. They tended to remain dry and hard, however, and showed little or no tendency to ulcerate. When she arrived in England, in August, 1914, the sores were still there, but dry, with a heaped-up scab on each. In September the sores were touched by a doctor with strong caustic. This made the scabs increase in size, but when these dropped off the condition appeared about the same.

In November, 1914, a sore appeared on the dorsal aspect of the proximal phalanx of the middle finger of the left hand. This looked more like a septic sore than anything else, and as patient had suffered from boils in India it was considered to be of this nature.

Examination.—April 7, 1915. I saw the patient on this date and found that the two sores on the face were apparently almost healed, being covered with scabs made up of heaped-up papery scales. The one on the finger was ulcerated in the centre and pus was oozing out from it. It looked certainly like an ordinary septic sore. Dr. Wenyon kindly came and saw the case and took cultures and films from the small sore on the forehead and also from the finger. Neither of the films showed *Leishmania tropica*. On April 15, however, he examined the cultures and found that both had given positive results, *L. tropica* having grown from both. This, then, settled the diagnosis.

Further Progress and Treatment of the Case.

The condition of the sores on April 15, 1915, was as follows: The scaly condition of the sores on forehead and side of face had improved, but the one on the finger had extended, the proximal phalanx of the finger being much swollen, as was also the dorsum of the hand in its vinicity.

I gave her a salicylic ointment to apply to the face sores every second day or so, and told her just to keep the finger one bandaged and clean.

April 30, 1915.—Face sores much the same; look as if they were healing up. Finger one: Swelling of dorsum of hand gone, but finger itself still much swollen, ulcerated surface larger. Found *L. tropica* in films from it to-day. Resolved to try methylene blue ointment, as recommended by Cardamatis and Melissidis in Greece, and used successfully by Wenyon in a case of Sir Patrick Manson's at the London School of Tropical Medicine.[1]

I prescribed this as follows:—

℞ Methylene blue,
Vaselin,
Lanolin, āā ʒjss,

and told her to apply this at nights.

[1] *Journal of London School of Tropical Medicine*, vol. i, part 3, p. 207, and vol. ii, part 2, p. 117.

May 6, 1915.—Face sores have shown activity again during last week; three little beads of pus came out of the one on the side of the face yesterday, and the scab is distinctly bigger. Finger one: ulcerated surface increased, but general appearance better, swelling and inflammation around being less. Prescribed further salicylic acid treatment for the face. To continue the methylene ointment for the finger.

May 13, 1915.—All the sores worse to-day. Scab on forehead one much increased. One on side of face looks as if it might break down; red round edges. Finger one: ulcerated surface increased and now much excavated, right down to the tendon; much clear serous fluid coming from it; inflammation around it worse. Stopped the methylene blue and salicylic ointment. Told her to wash them with 1 in 40 carbolic acid solution and then to put on boracic ointment.

May 20, 1915.—Sores about the same. Pus comes out of the one on side of face every morning. Finger one: no more excavation. No signs of healing, however, and still considerable discharge. Left epitrochlear gland tender to-day, slightly enlarged, and a hard lymphatic cord with nodes upon it can be felt running up extensor aspect of forearm. Do nothing but keep them clean.

June 3, 1915.—Much the same to-day. Three little nodes the size of small peas have now appeared on back of left hand. The two sores on face have scabbed over again and are dry. Resolved to-day to try local applications of tartar emetic, prescribing a 2 per cent. antimony tartrate ointment for application morning and night to the finger sore.

June 10, 1915.—Patient has borne the ointment all right. Sore on finger very much the same, perhaps it shows a little more sign of healing, but not much. Lymphatic cord on arm and the epitrochlear gland are smaller and much less painful, however. Go on with the ointment for another week.

June 17, 1915.—Patient stopped the ointment two days ago because she thought it was making the sore painful. Face sores about the same. Finger one tending to dry up and shows signs of healing now. All inflammation round the edges gone. Two lymphatic cords with nodules on them have, however, appeared above the epitrochlear gland in the upper arm. This is new. Leave sores alone now and do nothing.

July 2, 1915.—Marvellous change. Finger sore practically healed, all inflammation gone from it and a healthy scabbing all round its edge. Centre shows healthy granulating tissue. Nodules on lymphatics on dorsum of hand and up arms still about the same size but not inflamed or sore. Face sores have heaped-up scabs upon them now, no redness or inflammation round them. Suggested that she should rub in some antimony ointment on the skin over the nodules.

July 14, 1915.—The ointment caused irritation, so she stopped it on July 8. The condition produced was a pustular eruption which began to heal immediately on stopping the ointment. Finger sore apparently healed, covered with a dry white scab. Face sores still got their dry heaped-up scabs on them, but absolutely no signs of redness around them. Practically healed. Lymphatic nodules on arms going away. Those on back of hand still present.

August 24, 1915.—All the sores perfectly healed, scabs off all of them. The one on the side of the face has a few scales upon it. Pigmented scars left, smooth and thin, no thickening of skin or underlying tissues. Cured.

The case then brings out several points of interest. Firstly, as regards the tartarated antimony treatment. I was led to adopt this by the very excellent results obtained by Aragao and Vianna in ulcerating granuloma of the pudenda, and by Machado, Vianna, Carini and others in the leishmanial sores of South America by intravenous injection of this drug. It would seem that if the injection of 1 gr., say, of tartarated antimony into the general system can beneficially affect a local sore (the question of these sores being local will be discussed later), then the direct application of it to the surface, at least if ulcerated, should prove equally or even more efficacious.

There is a non-official Unguentum antimonii tartarati which has been incorporated in the British Pharmaceutical Codex, made up of tartarated antimony, 1; simple ointment, 4; *i.e.*, a 25 per cent. solution. This acts as a powerful counter-irritant, producing a pustular eruption, so was evidently too strong to use. One would not, of course, think of using a hydrargyri ammoniati ointment in such a strength, so I reduced in a similar way the antimony ointment to a reasonable strength, viz., 2 per cent.

This was borne quite well and did not seem to have any prejudicial effect on the ulcer, though, as has been stated above, it did tend to produce a pustular condition when applied for a longish period to the unbroken skin over the nodules.

I resolved to try the ointment treatment first, and if this failed to substitute injections of antimony similarly to those described by the South American observers and given so frequently for trypanosomiasis in this country now.

For this, of course, the patient would have required to go into hospital and stay in bed, and on the whole perhaps it seemed a somewhat drastic treatment.

One also considered the question of vaccines of killed cultures, as recommended by Row, and as tried by Wenyon in the case at the London School of Tropical Medicine, but as a cure resulted these were not required.

One swallow does not make a summer, nor does one case of apparent cure after the use of a certain drug prove that that drug caused the cure, and this is notoriously so in oriental sore. Sometimes, for no apparent reason, these sores begin to heal up of their own accord and rapidly cicatrise, so it is just possible that this is what happened here. In the case reported by Dr. Wenyon at the Tropical School the two sores on the face showed no signs of healing

until the methylene blue ointment had been applied, then they began rapidly to heal, and one was led to the conclusion that the drug had something to do with this. In my case, however, the methylene blue appeared to make the condition worse.

I have reported this case because of the grounds that led me to try the antimony ointment, and because I may not have the opportunity of treating another one for some time. Others more favourably situated might, I think, give the method a trial. The point is this: if the drug will act locally, then the trouble, and one might even say the dangers, of the intravenous route will be avoided. In the type of sore that does not break the skin and ulcerate, applications of ointments could hardly perhaps result in enough being absorbed to influence the condition, but in the ulcerated ones, in addition to the drug coming into actual contact with the parasites, a considerable quantity of it must be absorbed into the general system as well, and so act to a certain extent like an injection.

It is right, I think, to state that at the time the antimony ointment was being applied I also was giving the patient iron and arsenic by the mouth, and building up her strength with nourishing foods as well.

A second point of interest arising out of the case, as already hinted at, is the question: Are these sores as strictly local as they have usually been believed to be? Recent observers have thrown doubt upon this, and the American leishmaniasis would seem clearly to show that a general infection may follow. It is possible that the condition is general from the start, like kala-azar, and that the parasites circulating in the blood settle at different places and produce sores. Blows or abrasions might determine the point of lodgment. In the case just described the presence of the enlarged and tender epitrochlear gland with the thickened and inflamed lymphatics, nodulated in places—a condition which has also, I believe, been seen in other cases—certainly points to a general infection. It is unfortunate that one did not think of cutting out one of the nodules and demonstrating the parasite in it. Sepsis from the sore might easily, of course, cause the lymphangitis and adenitis, but the nodular thickenings of the lymphatics, I think, must have been due to the leishmania.

A third point of interest is that the cultures Dr. Wenyon made quickly died out, a second series doing the same. This is not usual, he informs me, as once the culture is started it is easy to keep it going. This may mean that the parasites were losing their virulence and the infection was coming to a natural end itself.

Lastly, it is evident that once a sore appears, however small, excision to be of any use must be done boldly and widely. If, as has been suggested, the infection is a general one, then it is questionable if such a procedure is of any use. The patient informed me that the carbonic acid snow method was largely used in Lahore for treating such sores when seen early. Cures were frequently reported.

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TROPICAL RESIDENTS AS SOLDIERS.

MANY men resident in the Tropics are at present joining local military forces or coming home with the intention of joining the Army. Some of the latter are given permission to do so by their employers, be they merchants or bankers; other men give up their billets, and by doing so often sever their connection with the firms or banks with but little chance of being taken back.

There is no doubt that recruits raised from the class of men under discussion are of the very best material to be found in the Empire, provided that they have not been too much run down by "climate" or disease. They have been carefully

examined physically before being allowed to join—even at home—the merchant's office or bank for training at the headquarters, and they are again submitted to an examination by a tropical expert before leaving home to join the foreign branches of the firm or bank. Their physical status is therefore certainly good, as all the unfit have been weeded out. Moreover, the very fact of men desiring to go abroad marks a type which is usually imbued with an ardent desire to "see" the world, or, in other words, the spirit of adventure. Although nowadays there is but little physical danger in such a step, yet the spirit is there, although the adventure is now commonplace.

The men are also of a class that is well fed, well clothed, well shod, and fond of out-of-door games and sports.

It might be thought that from amongst the class of men mentioned we ought to get excellent material, and so we do. It is evident, in the present state of affairs, that all available men should join one or other force, but should the man remain in, say, East or West Africa and join the local contingents, or proceed to England and throw in his lot with, say, the infantry or cavalry? Is the man likely to undergo the fatigues of a campaign better under tropical conditions to which he is accustomed or in the trenches in France?

Each of these steps has its recommendations and drawbacks. A tropical resident suddenly called upon to quit his office and take up active military work may find latent troubles develop of which both he and the doctor who examined him are wholly unaware. "Climate may have told on his heart muscle; malaria, of which previous indications were unrecognized, may declare itself in pronounced fashion; bowel irregularities, but little noticed and kept under control by mild rules of diet, &c., cause troubles which may lead to incapacity when the stern necessities of training for war are imposed. At the same time, the man inured to the Tropics knows how to take care of himself better than men newly imported from Northern Europe. He knows, usually, how to ward off sunstroke; bitter experience may have taught him the necessity of guarding himself from mosquito bites, exposing himself to chills, avoiding water from native wells, and the many dangers attendant upon living in a tropical climate under adverse surroundings.

On the tropical resident coming to England and proposing to join the Army, we have to deal with the fact that exposure to, say, the rigours of a winter in Northern Europe may develop latent diseases which were either unknown to exist or which had long been in abeyance. It is well known that the first evidence of malaria infection may show itself when the English Channel is reached, or even after some months of residence in the British Isles. An old dysentery may have so weakened the bowel that colitis supervenes on exposure or after fatigue; even filariasis has been known first to show itself as a lymph scrotum on the way home when colder regions are reached. These latent ailments may be impossible to diagnose by any method of examination, and the medical military board may be excused if such ailments develop when the soldier is apportioned to fighting in the trenches, where exposure, damp, and fatigue are ever-present agents.

In any case, there is a great risk in passing a man who has just come home from the Tropics for military service. It would be better were he allowed two or three months' residence at home before presenting himself for examination as to his fitness to serve. By that time he will have become somewhat acclimatized, at any rate, to a colder climate, and latent ailments will have almost assuredly developed should they happen to have been present.

Morning diarrhœa is apt to be neglected by a tropical resident; he grows so accustomed to it that he does not think it is a disease at all, but a mere habit. In time he, of course, learns differently, but before that period is reached he may have been selected by a medical board and sent to the Front. His career there is destined to be a short one, owing to increased diarrhœa and advancing weakness.

An enlarged spleen should be regarded as a sure detriment to joining the Army, especially for campaigning in northern climates; the reasons for this are evident.

To summarize, the ailments that prohibit tropical residents taking up military duties on reaching England are: Malaria, whether active or latent, chronic dysentery, colitis of even the mildest type, morning diarrhœa and sprue, enlarged spleen, latent filariasis, and hepatic enlargements.

There is something to be said in favour of taking regiments from northern climates and at once embarking them on military expeditions in the Tropics: they are not malaria-infected, neither dysentery nor colitis is likely to develop for some time at any rate; they do not feel the tropical heat for some time after reaching their destination, for the heat acts as a stimulant at first and for a few months afterwards. The drawback is that when disease supervenes, be it malaria or dysentery, the majority of a regiment are stricken at the same time, and it is thereby suddenly reduced in strength.

It would seem, therefore, that "climatization," as it is termed, is necessary for tropical residents coming to Europe and for white troops coming from northern countries to the Tropics before being put in the fighting line.

Vaccine Treatment of Gonorrhœa.—W. G. Brett, in the *British Medical Journal*, August, 1915, states that he treated thirty-three cases of acute gonorrhœa with gonococcus vaccine (Burroughs Wellcome and Co.) with complete success. The urethra was washed out thrice daily with weak solution of permanganate of potash and 1 c.c. of the vaccine (200 million cocci) was given. After two days a second dose of 1,000 million was given, and a third of the same strength repeated after two or three days if the discharge did not show signs of abating. The signs of symptoms disappeared after nine days, and after thirteen to fourteen days the patients were pronounced free of the disease.

Annotations.

Splenic Anæmia, including Early Splenectomy and Necropsy Two Years later (T. S. Roberts, *Journal-Lancet*, August 15).—There was nothing in the history suggestive of the cause of the disease. There was a marked leucocytosis soon after operation, which persisted and increased to the end. The average number of white cells in eight counts before operation was 4,925; the lowest, 2,700; highest, 6,500. The average of twelve counts after operation was 15,985; lowest, 9,000; highest, 25,000. There was throughout a rather unusually high hæmoglobin percentage, the general average being 62 per cent.; the average colour index was 8; highest, omitting one of 2·2 and one of 1·4 occurring soon after sharp hæmorrhages, was 1; lowest, 0·6. A notable irregularity in the shape and size of the red cells was always present, and during the last year became pronounced. Gastric and intestinal hæmorrhages occurred only after the removal of the spleen. There was no jaundice or pigmentation of the skin. There were several periods of improvement, two especially prolonged and pronounced, suggesting recovery; but there was no corresponding improvement in the condition of the blood. Splenectomy, even though done early, did not arrest the disease or modify its course in any way. The clinical diagnosis of uncomplicated splenic anæmia was apparently confirmed by the necropsy. The only other important pathologic condition was a moderate grade of parenchymatous nephritis; but this did not seem sufficient to account for the death of the patient, and, moreover, the progress of the case to the end was like that of splenic anæmia, not nephritis.

Respiratory Signs and Symptoms in Trichinosis. (R. G. Minot and F. G. Rackermann, *Amer. Journ. Med. Sci.*, October).—Of one hundred and two cases of trichinosis, the diagnosis in 70 per cent of the cases was made by finding the embryo in excised pieces of muscle or in the blood; in 5 per cent. no parasite was found, but the muscle showed a histologic picture of a myositis such as is found when trichinæ are present; in 25 per cent. by the history, symptoms, and physical signs, and the eosinophilia which varied from 13 to 63 per cent. of the total leucocyte count. All the patients recovered except one, and although this patient had moderate dyspnœa, no abnormal physical signs in the lungs were detected. In 50 per cent. of the 102 cases there was no mention of cough or abnormal lung signs at any time during the course of the disease, but in the remaining 50 per cent. sixteen patients (15·6 per cent.) had cough without abnormal physical signs in the lungs, while seventeen (16·6 per cent.) had cough with abnormal lung signs, making thirty-three patients (32·3 per cent.) that had cough beginning from one to twelve days (usually two to six) after the onset of the disease and lasting three to twenty-five days or throughout the course of the illness; eighteen patients (17·6 per cent.) had abnormal signs in the lungs without cough, making thirty-five patients (34·5 per cent.) that had abnormal physical signs in the lungs. These physical signs were present within forty-eight hours after the patient entered the hospital in thirty-two cases, and in three cases within six days. The duration of these signs seemed to depend on the length of time the temperature remained elevated, the signs disappearing as the temperature fell. If the signs were slight they existed, as a rule, but for a few days, and only at the height of the fever. Nine cases showed respiratory signs or symptoms, or both, severe enough to lead to a serious consideration or actual diagnosis of purely pulmonary conditions during the first few days the patients were in the hospital.

Abstracts.

TRICHINOSIS SIMULATING FRONTAL SINUSITIS.[1]

By Edward L. Pratt.

Three cases of trichinosis were each referred as a probable case of frontal sinusitis. Trichinosis resembles at the onset typhoid fever and its symptoms are usually classified under (1) intestinal or choleriform stage; (2) rheumatic or typhoid phase. It sometimes simulates appendicitis and is frequently called "rheumatism."

Case 1.—Mrs. B. R., aged 31, a physician's wife, on February 10, 1913, complained of a severe "cold in the head," excessive thick nasal discharge from both nares, and headache. Duration three or four days. Examination revealed infection in both maxillary antra. The antra were cocainized and punctured beneath the inferior turbinates and a large amount of thick muco-purulent secretion was washed out of both antra. The antra were washed out daily for about ten days, when the patient was discharged cured. Patient remained apparently well until March 15, 1913, when she began to have pain in and about the left eye and left frontal region. In view of the fact that she had but recently recovered from an infection in her antra, her husband suspected that she might have frontal sinusitis and sent her in to the office. Examination of the nares revealed only a slight amount of congestion of the mucous membrane. Transillumination of the sinuses showed that the left frontal sinus illuminated well over a moderate-sized area; the right frontal illuminated poorly over a very small area; the antra illuminated equally and well. The Röntgenograms showed an absence of a frontal sinus on the right side, a fronto-ethmoidal cell taking its place; on the left side the frontal sinus was of moderate size and of normal appearance. The antra were also normal; the eye

[1] Abstracted from the *Journal of the American Medical Association*, October 9, 1915.

examination was negative. Nasal examination remained negative. It was now noted for the first time that the patient had an œdema of both upper lids, but no œdema elsewhere. Trichinosis was suspected, and on questioning the patient it was learned that she had recently eaten pork and that she had had a slight amount of muscular soreness in the region of the left deltoid insertion. The diagnosis was confirmed by the following blood count: white blood cells, 14,000; eosinophiles, 22 per cent. The case ran a mild, uneventful course terminating in recovery.

Case 2.—Mr. A. complained of pain in and about the left eye. As examination of the eyes had been negative he was referred as having a probable frontal sinusitis. Examination revealed an œdema of both upper lids, more marked on the left than the right, but no œdema elsewhere. Nasal examination was negative. His frontal sinuses illuminated equally and well as did also the antra. A diagnosis of trichinosis was made and a differential blood count showed 20 per cent. eosinophiles. This patient gave a history of having indulged freely in pork, and also stated that he had had "rheumatism" in many of his long muscles.

Case 3.—Miss L. B. B., aged 32, had been ill for about a week, suffering from nausea and vomiting, pain in the right shoulder and in right chest posteriorly. Physical examination had been negative except that a small area of dulness was found in the right chest posteriorly; no change in the breath sounds, no râles or friction rubs were heard. When seen she complained of pain in the region of the left upper lid and left frontal sinus, and as she had a slight "cold in the head" it was thought well to eliminate the possibility of an acute frontal sinusitis. Examination showed œdema of both upper lids and a moderate amount of puffiness of the face, but no œdema elsewhere. There was no muscular tenderness. Examination of the nose and accessory sinuses was negative. She gave a history of having eaten pork frequently. A diagnosis of trichinosis was made and a blood count ordered. The count was as follows: white blood cells, 15,000; polymorphonuclears, 77 per cent.; lymphocytes, 16 per cent.; eosinophiles, 6 per cent.; transitionals, 1 per cent. The next day she developed very severe muscular pains in both lower extremities and in the left wrist and left hand, and a moderate pericarditis. Vomiting persisted and the patient was extremely ill for the next week. Two more counts were made at intervals of three days each and showed an increase of eosinophiles, first to 14 per cent. and later to 22 per cent. Her symptoms gradually subsided and she made a complete recovery.

The diagnosis in all three cases rested on (1) œdema of the lids (and in Case 3 of the face also) with absence of œdema elsewhere; (2) negative nasal findings referable to the accessory sinuses; (3) the history; (4) the eosinophilia. It will be noted that in all these the "presenting symptom" was pain in the region of the eye and frontal sinus; in only one case (Case 3) was the so-called choleriform stage present.

Review.

THE BIOLOGY AND TREATMENT OF VENEREAL DISEASES AND THE BIOLOGY OF INFLAMMATION AND ITS RELATIONSHIP TO MALIGNANT DISEASE. By J. E. R. McDonagh, F.R.C.S., Surgeon to Out-patients, London Lock Hospital. London: Harrison and Sons. 1915. Price £1 1s.

What appears to be a most useful and excellently produced treatise on the subject of venereal diseases is deprived, to some extent, of its practical value by the introduction of much speculative and theoretical matter on the question of the parasite of syphilis. The matter referred to is presented to the reader in a dogmatic manner, and it is taken as the foundation of much of the description of the disease. It seems a pity that a sharper line has not been drawn between what is purely speculative and that which is established fact, for in reading the descriptions given and following the beautiful reproductions which illustrate the book one's mind naturally turns to a certain group of German protozoologists who have plunged into speculations regarding the life-cycles of certain parasitic protozoa, using as their basis of investigations complicated cycles which are themselves only of theoretical value. They have worked with a mass of material, the parasitic nature of which in their case cannot be doubted, and from this mass, consisting in many instances of degenerating organisms and even mixed cultures of different organisms, they have sorted out those forms and stages which conformed to their preconceived schemes of evolution, neglecting the others which they did not require. The results of this anomalous process of investigation they have presented to the world as proved life-histories of protozoa of such a complicated nature that anyone who knows the difficulties of obtaining proofs of much simpler matters is forced to regard them with a great amount of scepticism, if not incredulity. As a matter of fact, these speculations have in every instance been unable to bear the strain of subsequent more careful research.

As regards the organism of syphilis as described by the author of this book the fallacies are even greater than those which had to be met by the school of German protozoologists referred to above, for the material used in his case was not all parasitic but an intimate mixture of normal and degenerating tissue cells and the spirochæte of syphilis. The protozoologist at once realizes how impossible it is at times to distinguish changed and altered fragments of degenerating cells and nuclei from some protozoal organism. The protoplasm and nucleus of a protozoon are essentially the same as the protoplasm and nucleus of a tissue cell, and the latter, when they commence to disintegrate and change chemically under the stimulus of some actual invasion by parasites or through toxic irritation, will assume shapes and forms which can be confused by the most experienced with know

stages of development of protozoal parasites. If tissue cells maintained a constancy of structure and appearance comparable with the cells of the blood-stream it might be possible in certain cases, as it has been, to arrive at the conclusion that strange bodies appearing there are of parasitic nature, but in tissue, and above all in skin and gland tissue, which contains cells which have the peculiar property of altering and changing in most extraordinary variety of ways, it becomes impossible at times, with the means we have at our disposal, to explain the origin of some of the peculiar structures which make their appearance. We have no alternative but to admit this and trust that methods of investigation will so improve that one day we may hope to have better and more accurate means at our disposal. It is well to remember that tissues react in different ways to different parasites and the constancy of the appearance of objects resulting from reaction to any particular parasite is no proof that the constantly appearing objects are themselves parasites. It is manifestly possible, however, to sift from such a collection of non-parasitic objects a series of structures which can be arranged in any scheme we like to elaborate. If we take the cycle of development of the malarial parasite and place it before us, we will be able by the careful examination of changed and altered tissue cells to pick out objects which resemble, sometimes closely, the various stages of the malarial parasite. By the side of each stage of our known cycle of the malaria parasite we place those corresponding objects which resemble it most. By the time we have finished this, and especially if we have spirochætes in the tissue, with their peculiar motility and power of penetration, to place beside the microgametes of malaria, we shall have secured a series of gradations in structure which can easily be elaborated into a hypothetical species of plasmodium. Consciously or unconsciously we have ignored all those objects which do not fit into our known scheme of malaria or, if we are still bolder, we will create other alternative cycles for their reception. Our results, of course, would be purely speculative and without any real foundation or value, though we may still be able to demonstrate our cycle in a series of preparations to those who care to see it, and to illustrate it in a series of coloured plates and photomicrographs. The unsurmountable fallacy in the whole of this investigation would be that we had completely failed to establish the one essential point, namely, the parasitic nature of the bodies under observation. Some such explanation, for no other appears to us possible, accounts for the life-cycle of the leucocytozoon of syphilis which the author brings before his readers. There is not a single stage of his parasite which cannot be explained in some way other than that which he gives. The most natural explanation would be that the bodies are the result of cell degeneration and disintegration, and far greater evidence of parasitism than he has been able to produce is needed before we are justified in giving up this view.

But the culture of the spirochæte of syphilis and its undoubted multiplication by division in these cultures, as demonstrated first by Noguchi, makes the author's cycle of development practically inconceivable. In this cycle the spirochæte plays the part of the male gamete, corresponding in every way with the male gamete of malarial parasites or spermatozoa of higher animals. It is known that these have reached an end stage of development and do not reproduce: on the other hand, they invariably die unless they can fertilize a female gamete. Our whole conception has to be changed if we accept the author's view, for the culture of the spirochæte means that we are cultivating male gametes: in other words, spermatozoa are reproducing themselves by division in these cultures. Science may have made much progress, but it has not yet made this. When it does, the culture of the ovum will also doubtless be an accomplished fact. The results which are likely to ensue from the culture of ova and spermatozoa are so fascinating that one would like to pursue the inquiry further, but this is hardly the *métier* of a scientist—rather should it be left to such a master of the speculative as Mr. H. G. Wells, the creator of that famous form of celestial nourishment which resulted in the overthrow of order in this world of ours.

In this review we have been concerned with the parasite of syphilis rather than the qualities of the book as a treatise on venereal diseases. In this respect it seems to be most excellently arranged, and treats of all branches of the subject in an eminently practical manner. As far as we are aware, no book has hitherto covered exactly the same ground, and in consequence of this it is bound to have a wide circulation. One of its many merits is the beautiful coloured illustrations, which show at a glance what no amount of text description could hope to reveal.

COUNTING THE WORLD'S COST.

According to the report of the International Office of Hygiene in Paris, bubonic plague prevailed to some extent in 1913 in almost every part of the world, there being as yet no evidence that the present world-wide epidemic of this disease, which started about twenty years ago, has begun to subside. A marked decrease was shown in India, where, in 1911, there were 846,873 deaths from this disease, while in 1913 there were only 217,148. On the other hand, the reports for 1914, so far as received, show an increase. Cholera was also less prevalent in India in 1913 than in previous years. There were no serious epidemics of yellow fever during the year in any part of the world.

CASUALTIES TO PHYSICIANS IN GERMANY.

Up to August, 302 physicians have been slightly wounded, 108 severely wounded, 185 killed; 84 have died from sickness, 1 succumbed to gas poisoning; sick, 1; prisoners, 81; missing, 83.

Original Communications.

STREPTOCOCCUS EQUINUS SEPTICÆMIA IN THE ANGLO-EGYPTIAN SUDAN.

By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.
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AND

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Introductory.—This is the first of what is hoped will be a series of short notes dealing with streptococcal infections, as seen in the Anglo-Egyptian Sudan.

It owes its origin to our meeting with a case of septicæmia in which we obtained *S. equinus* Andrewes and Horder 1906 in pure culture in blood taken from a vein during life, and as this appears to be the first time in which this organism has been recorded as being pathogenic to man, and also the first time that it has been seen in the Tropics, we think that a few remarks may be of general interest.

Historical.—*S. equinus* was first differentiated by Andrewes and Horder in 1906, when they found it to be present, abundantly, in air and in horse dung in London, and stated that:—

> "so far as is known, it is totally devoid of pathogenic properties."

Gordon had previously recorded it as a common group form in London air, a fact corroborated by Andrewes alone and with Horder.

It can be recognized, in the paper published by Houston in 1905 on the streptococci present in normal human fæces, as forming 5 per cent. of his Series I, 13 per cent. of Series II, and 3 per cent. of Series III, *i.e.*, in 7 per cent. of 300 strains of streptococci obtained from normal human fæces, and, with a neutral red variant, this can be raised to a total of 8·8 per cent., while it does not appear in the 100 strains of streptococci obtained by the same worker in 1906 in cow's dung.

In 1908 it is accepted by the Winslows as a good species in their work on the Coccaceæ.

In 1910 Winslow and Palmer found it in horse dung, human fæces, and cow dung, and it is probably represented by Group II of Stowell, Hilliard and Schlesinger's classification, published in 1913; while Fuller and Armstrong, in the same year, found it present in the proportion of 3 per cent. of human, 4 per cent. of bovine, and 55 per cent. of equine fæcal streptococci.

Hopkins and Lang, in 1914, also recognized an equine group characterized by failure to ferment lactose. This paper completes the literature at our disposal in Khartoum, in which we have been able to find definite references to *S. equinus*.

Clinical History.—A young Sudanese man, aged 20, who attended animals, including a donkey, accidentally injured his left big toe, tearing off the nail. He left this injury untreated, but came to have it dressed some days later when the affected area was seen to be in a very dirty condition. After this he did not again apply for treatment until some eight days had gone by and not until one of the glands in the groin had suppurated and burst, when he said that the abscess had been present for three days.

At that time he had no fever and his various organs were normal, with the exception of his spleen, which was slightly enlarged. There was no history or signs of syphilis or of gonorrhœa.

He was treated for five days in the Civil Hospital, when the discharge from the abscess gradually diminished and he remained without fever. On the sixth day after admission he became worse, his temperature rose suddenly to 105° F., and with fluctuations he continued to have high fever, rising to about 105° to 106° F., until he died. His blood was examined for malarial parasites but none were found. Cellulitis in the groin and scrotum now set in and his peripheral blood was examined culturally in broth, and *S. equinus* Andrewes and Horder 1906 obtained in pure culture. He was treated with the usual anti-streptococcus serum, but he quickly became worse, the cellulitis spread and he died on the tenth day after admission into the hospital and on the fifth day after the rise of temperature and third day after the onset of the cellulitis.

Post-mortems are always difficult to obtain in a Mahommedan community, and especially so just now, and no such examination was possible in this case.

Etiology.—The septicæmia which killed the boy was caused by the presence of a long-chained streptococcus in his peripheral blood.

Morphological Characters.—The organism mentioned above was obtained in pure culture in a human blood broth flask, and when examined was found to be non-motile and non-encapsulated and to measure 1·4 microns in transverse diameter, and to be arranged in long chains.

It was Gram positive but not acid-fast as tested by the Ziehl-Neelson method.

Biological Characters.—It produced the usual small translucent colonies, typical of streptococci, when grown aerobically upon agar-agar at 22° C., 30° C. and 37° C., but it failed to grow at 60° C.

It grew also under anaerobic conditions at 22° C. and 37° C.

Cultural Characters.—On agar slants it produced small discrete translucent colonies without any sign of pigment, and in agar stabs there was a translucent growth along the track of the needle, but not on the surface. It grew in a similar manner on glycerine agar, glucose and maltose agar.

It did not grow on gelatine at 22° C. either as a slant or as a stab. In broth and ascitic broth it produced a white deposit, above which the liquid remained clear. There was no visible growth on potato.

Biochemical Reactions.—Its qualitative carbo-

hydrate and alcoholic reactions were determined in peptone media containing 1 per cent. of the reagent to be tested. It was not possible, owing to the difficulty of obtaining sugars, to raise this percentage above the figure indicated. As is now customary in this laboratory, Andrade's indicator was used. All tubes were read at the end of two days after incubation at 37° C. and the usual precautions as to the use of controls and microscopical examinations were taken, while all the media were inoculated directly from the original blood broth flask.

Acidity, without the production of gas, appeared in the following media:—

Monosaccharides.—Hexoses: Glucose, fructose. *Pentose:* Xylose.

Disaccharides.—Saccharose and maltose, but in the latter only very slightly.

Polysaccharide.—Dextrin.

Glucoside.—Salicin.

Alcohols.—Tetrahydric: Erythrol.

It neither produced acidity nor gas in:—

Monosaccharides. — Pentoses: Arabinose and rhamnose.

Disaccharide.—Lactose.

Trisaccharide.—Raffinose.

Polysaccharides.—Inulin, starch (amylum), and glycogen.

Glucoside.—Amygdalin.

Alcohols. — Trihydric: Glycerol. *Pentahydric:* Adonitol. *Hexahydric:* Dulcitol and mannitol.

It failed to clot milk, and to reduce neutral red, when tested aerobically and anaerobically.

It was not hæmolytic when tested by human and rabbits' blood, and there was no lysis when bile salts were added to a broth culture.

Quantitative estimations of the acidity were performed with such sugars as we were able to spare for the double qualitative and quantitative tests, as it is exceedingly difficult at this time to obtain these reagents in anything like the quantity we require.

The medium used was composed of Lemco 1·2 per cent., peptone 1 per cent., carbohydrate or alcohol 1 per cent., salt 0·5 per cent., the whole being standardized to + 10 and incubated for forty-eight hours, after which all the inoculated tubes were examined microscopically and were found to show a good growth of chains, except in lactose and saccharose, in which they were rather scanty.

The acidity was determined by the titration of 5 c.c. of the control tube against $\frac{N}{20}$ KOH in the cold, with phenolphthalein as an indicator, followed by a similar titration of a like amount of the inoculated tube when the number of cubic centimetres of $\frac{N}{20}$ KOH used for the control subtracted from those required by the inoculated tube showed the acidity produced by the streptococcus expressed in cubic centimetres of $\frac{N}{20}$ KOH.

The result was as follows:—

	Blood Streptococcus.
Glucose	1·5
Saccharose	1·7
Lactose	0·0
Raffinose	0·4
Salicin	1·8
Mannitol	0·1

Pathogenicity.—It produced a fatal septicæmia in rabbits in twenty-four hours when inoculated from the original culture intravenously, but was non-pathogenic when injected into a rabbit intraperitoneally, though it produced a septicæmia and death in gerbils when introduced in that way.

It also caused a fatal septicæmia in man.

Generic Classification.—The organism just described above appears to us to belong to the genus *Streptococcus* Billroth 1874, because:—

(1) It is a Gram positive, non-encapsulated coccus, found in long chains of twenty to thirty members in broth cultures.

(2) It is a facultative anaerobe which produces small translucent discrete colonies on agar-agar when grown aerobically or anaerobically at 37° C. or at 22° C. In stab cultures there is no surface growth, but along the track of the needle there is an effused translucent growth.

(3) Certain monosaccharides, disaccharides, a polysaccharide, a glucoside and an alcohol are fermented with the production of acid without gas formation.

(4) Inulin is not fermented.

(5) There is no visible growth on potato, and nitrates are not reduced.

(6) No lysis takes place when bile salts are added to its broth cultures.

(7) It is a parasitic organism.

It may, perhaps, be pointed out that none of these characters taken singly forms a reliable test for a streptococcus, but that considered "en masse" they fairly well define the genus *Streptococcus* Billroth 1874.

Specific Classification.—As is well known, the determination of specific rank in the genus *Streptococcus* is surrounded with much difficulty and marked by a most puzzling confusion, and it is necessary that anyone attempting to study the Streptococci should have a clear meaning of the word "species" as applied to these organisms. This conception of a streptococcal species may be obtained by reference to the valuable writings of Andrewes alone and with Horder, and to those of the Winslows, while the mutations which are met with in experimental work can be found in the writings of Ruediger, Anthony, Ainley Walker, Davis, Buerger, and Rittenberg, but more especially in those of Rosenow, while the fallacies to which experiments and especially animal inoculations lie open have been ably studied by Holman.

As all this literature is recent and easily available for English readers, we need not recapitulate it, and all that is necessary for our present purpose is to condense our views into a Provisional Diagnostic Table, such as that given below, deferring the reasons for this classification until a future occasion.

One point in the table requires explanation and this is the formula defining Group VI, which is described as S. H. & S. (I). The letters S. H. & S. stand for Stowell, Hilliard and Schlesinger, while the number in brackets indicates the first group of streptococci described by them in 1913, which is comparable with a group found by Winslow and Palmer in 1910. It may be a separate group, but

most probably is a variant of the *Equinus*, and perhaps of other groups.

Attention may also be drawn to the fact that an organism which ferments a Trisaccharide usually ferments also some disaccharides and monosaccharides, while a streptococcus which can acidify a disaccharide can generally ferment some monosaccharides.

The principal streptococci found in equine fæces are glucose, with or without saccharose, fermenters, while those of human fæces acidify glucose, lactose, saccharose, and salicin, and those of bovine fæces ferment glucose, lactose, saccharose, and raffinose, and may or may not ferment salicin, while some do not ferment glucose and some few acidify inulin. Aberrant groups are met with in all these types, but one feels that Group VI and those members of Group VII which ferment inulin or raffinose or reduce neutral red are probably variants of organisms of a more regular type.

PROVISIONAL DIAGNOSTIC TABLE OF STREPTOCOCCAL GROUPS.

	A. *Parasitic on plants.* Grow in broth but not on agar or gelatine	*I. Sphagni group.*
	B. *Parasitic in animals.* Grow in broth and on agar and usually on gelatine :—	
	F. Obligatory anaerobes ...	*II. Fœtidus group.*
	G. Aerobes, facultative anaerobes :—	
	M. Pigment present ...	*III. Sanguineus group.*
	N. Pigment absent :—	
	R. Gelatine actively liquefied	*IV. Gracilis group.*
	S. Gelatine usually not or rarely slightly liquefied. Inulin usually not fermented :—	
	I. Gas produced ...	*V. Mastitidis group.*
	II. Gas not produced :—	
Non-fermenters	(a) Glucose and other sugar media not fermented ...	*VI. S. H. & S. (I) group.*
Monosaccharide fermenters	(b) Glucose usually and other sugars generally *fermented* :—	
Equine fæcal type	1. *Glucose alone* or with *saccharose* and *salicin*, but not with lactose, fermented ...	*VII. Equinus group.*
Disaccharide fermenters Human fæcal type	2. *Lactose, glucose, saccharose and salicin, and sometimes mannitol* but not raffinose, *fermented* :—	
	(a) Mannitol not fermented ...	*VIII. Erysipelatis group.*
	(b) Mannitol fermented ...	*IX. Fæcalis group.*
Trisaccharide fermenters. Bovine fæcal type	3. *Raffinose, lactose, saccharose, usually glucose, sometimes salicin and rarely inulin,* but not mannitol *fermented* ...	*X. Salivarius group.*

It will be observed that, as the organism which we are considering is a human parasite, it agrees with (B) as it is a facultative anaerobe with (G); as it does not possess pigment with (N), and as it does not ferment inulin and does not liquefy gelatine with (S).

It does not produce gas and therefore comes under II, but it ferments glucose, saccharose and salicin, but not lactose, and therefore is placed in VII Equinus Group, which we will now consider.

The Equinus Group.—Andrewes and Horder's investigations showed that fifty-four out of ninety-four air colonies of the group and seven out of thirteen horse dung colonies ferment saccharose and salicin, and adding in the variant which failed to affect salicin the total became sixty-two for the air, while the other figure remained unaltered.

Therefore, by far the commonest sub-group which they met with fermented glucose, saccharose, and usually salicin, and to this sub-group they gave the specific name of *S. equinus* in 1906.

There was, however, another sub-group left which failed to ferment saccharose and which might or might not ferment salicin. This sub-group accounted for thirty-two air and six horse dung colonies out of totals of ninety-four and thirteen respectively.

Winslow and Palmer found the whole group to be present in 73 per cent. of equine, 27 per cent. of bovine, and 23 per cent. of human fæcal streptococci investigated by them, but unfortunately they only used glucose, lactose, raffinose and mannite and therefore their results cannot be subdivided according to the fermentation or non-fermentation of saccharose.

Fuller and Armstrong showed that the whole group occurred in 55 per cent. of the horse dung streptococci which they examined.

With regard to the group of non-fermenters found by Houston, Winslow and Palmer, Stowell, Hilliard and Schlesinger, Fuller and Armstrong, and other observers, it may contain an aberrant form of *S. equinus*, but being found in human and bovine fæces as well as in equine fæces it cannot be clearly assigned to any single group.

The Equinus Group was not found in the fox and stoat, which were taken as examples of carnivora, by Andrewes and Horder.

We thus have two fairly distinct sub-groups in the Equinus Group which are differentiated by the presence or absence of saccharose fermentation.

With regard to the further analysis of the group, we note that according to Andrewes and Horder the typical *S. equinus* is incapable or barely capable of growth at 20° C., and that it forms little or no acid in milk, which it therefore does not clot, and that it should ferment coniferin (a reagent which cannot be obtained at the present time), and that it should not reduce neutral red.

The less common variants which they record are a form which ferments inulin and another which ferments raffinose and inulin, and also some which reduce neutral red.

We thus obtain a classification of the group into the following sub-groups:—

DIAGNOSTIC TABLE.

Glucose, salicin and usually saccharose, but not lactose, fermented; feeble or no growth at 20° C.; milk not clotted	*Equinus group.*
A. Raffinose and inulin not fermented and neutral red not reduced	*Typical sub-group.*
I. Saccharose fermented ...	*S. equinus.*
II. Saccharose not fermented ...	Andrewes and Horder. Winslow and Palmer. Broadhurst (A). S. H. & S. (II). Fuller and Armstrong.
B. Raffinose or inulin fermented or neutral red reduced	*Atypical sub-group.*
I. Neutral red reduced	Andrewes and Horder.
II. Neutral red not reduced :—	
(a) Raffinose and inulin fermented	Andrewes and Horder.
(b) Inulin only fermented ...	Andrewes and Horder.

From this table it will be observed that the organism in the young man's blood agrees with the Equinus Group, with the typical sub-group, and with the species *S. equinus*.

We are therefore forced to the conclusion that it is the same organism as *S. equinus* Andrewes and Horder 1906, which is now for the first time, as far as we know, reported as being present in Africa, although previously found in Europe and America.

S. equi.—Before finally leaving the subject of the Equinus Group, it is necessary to say a few words upon the subject of the organism variously known as *Streptococcus equi* Schutz 1888, or *S. coryzæ contagiosæ equorum* Eisenberg, *S. equi* Capelletti-Vivaldi 1899, and *S. capelletti* Chester 1901, which causes the disease called strangles, distemper, or adenitis equorum in horses.

The question naturally arises as to whether this pathogenic organism might be the cause of the young man's septicæmia and therefore it is necessary to know its characters and its position in our scheme of classification. This would have been a matter of great difficulty if Koch and Pokschichewsky had not published their valuable paper on this organism in 1913, but with the aid of their researches a differentiation can be made.

Briefly stated, the characters of *S. equi* are :—

Morphological characters.—It is a Gram-positive coccus, varying in size and appearance and occurring singly, in pairs, or in short or long chains.

Biological characters.—It grows poorly at 20° C., but well at 30° C. and 37° C., and is a facultative anaerobe.

Cultural characters.—On *gelatine* it forms very fine white points along the track of the needle in a stab, but not on the surface, while on *agar* the very small colonies are discrete, watery, and stick to the medium, and on *ascitic agar* the colonies are typical and droplike.

In broth it forms fine flakes which accumulate at the bottom, while the supernatant liquid may remain clear or may be turbid. There is no growth on potato.

Biochemical reactions. — It ferments glucose, fructose, galactose, mannose, saccharose, maltose, and sometimes lactose and sorbitol, with the formation of acid but no gas.

It does not acidify raffinose, mannitol or dulcitol.

It is strongly hæmolytic and coagulates milk.

Quantitative reactions expressed in terms of normal NaOH per cent. are: glucose 1·5 to 2·9, mannitol 0·0 to 0·1, but are not recorded with regard to other sugars.

Pathogenicity. — Injected subcutaneously into mice it causes abscesses, local and metastatic, and enlargement of the lymph glands. Injected intravenously into rabbits it causes a fibrinous pericarditis, but these animals are less susceptible to its action than mice. Introduced intranasally into a horse it causes nasal catarrh and suppuration of the submaxillary lymph glands; signs which are typical of the naturally acquired disease. Injected subcutaneously into horses it causes abscesses. It is not known to be pathogenic for man.

The point to be discussed with reference to this organism is whether or not it ferments lactose, and we consider that it does, because it produces acid four times out of ten tests, according to Koch and Pokschischewsky, who found that *S. erysipelatis* only fermented the same sugar seven times out of ten; and it is more likely for an organism to fail to ferment a sugar which it is accustomed to acidify than to ferment an unusual reagent unless this is a reversion to ancestral type.

If this is allowed then *S. equi* belongs to *VIII*, the Erysipelatis Group, which we consider to be its correct position, and its differentiation from *S. equinus* is therefore easy, if the provisional diagnostic table is studied.

Method of Infection.—As the young man was employed in attending animals, including a donkey, it appears to us possible that streptococci acquired from equine fæces gained an entrance to his tissues through the injury to his toe, and that, for a time, they were stopped by the inguinal glands, but later spread, causing cellulitis and septicæmia from which they were recovered in pure culture.

Our view that the streptococcus came from an equine and not from a human source is supported by Winslow and Palmer's observation that *S. equinus* from human fæces produces twice as much acidity in glucose as when obtained from equine fæces.

The mode for *S. equinus* from equine fæces in glucose is 1·8, while that for the same organism from human fæces is 3·8. The amount of acidity which our strain produced being expressed as 1·5 c.c. of $\frac{N}{20}$ KOH is comparable to Winslow and Palmer's 1·8, as we both used 5 c.c. of the contents of the incubated tubes and both titrated them against $\frac{N}{20}$ KOH or NaOH, using phenolphthalein as the indicator, while the media were practically the same, except that we used 1·2 per cent. Lemco and they 0·25 per cent., while in both the figures given for acidity represent the value obtained for the inoculated tube less that obtained for an uninoculated control incubated under similar conditions.

This observation also favours a derivation from equine rather than bovine fæces, as the latter give the mode at 2·3 for glucose.

The question as to the nature of the streptococci normally found in equine fæces in the Sudan will not be considered here, but in a future communication.

It appeared to us peculiar that no observer had reported *S. equinus* as being pathogenic in any form and therefore we searched through some of the

protocols of recorded experiments with the result that it appears to us probable that Beattie and Yates met with this organism at least once in the forty-two strains examined by them. Our reasons for this statement are based upon the fact that their strain No. 35, which they class under *S. pyogenes* and its variants, and which came from a septic throat, fermented saccharose and salicin and acidified milk without forming a clot, while it failed to ferment lactose, raffinose, inulin and mannitol, and therefore agreed with *S. equinus* Andrewes and Horder 1906 in all applied tests.

When inoculated into a rabbit it produced a fatal septicæmia, exactly as in our case, from which it was apparently recovered, when it again gave exactly the same reactions or, in other words, it remained unchanged by a passage through an animal.

It would thus appear that *S. equinus* is probably more pathogenic than has generally been believed. Perhaps the explanation is that a strain derived from equine fæces, if it gains entrance to the tissues, is pathogenic to man, and after passage through him to animals; while those from human or equine fæces are non-pathogenic to animals.

Conclusion.—We are of the opinion that the septicæmia which brought about the young man's death was caused by *Streptococcus equinus* Andrewes and Horder 1906, and that possibly the infection was derived from equine fæces and entered the body through a wound on one of the toes.

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NOTES ON "CASTELLANI'S BRONCHO-SPIROCHÆTOSIS," WITH REPORT OF A CASE.

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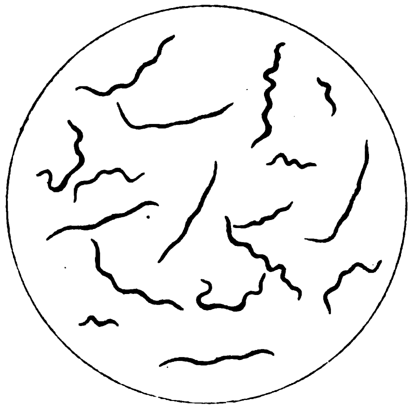
BRONCHOSPIROCHÆTOSIS, the disease described by Castellani some years ago, has recently been the subject of further investigation in various countries. It may be of interest, therefore, to put on record a case I have observed in Serbia, and in connection with this case it may not be out of place, perhaps, to make a few general remarks on the malady.

History.—The affection was first described in 1905 and 1906 by Castellani, who also gave a description of its etiological agent, which he called *S. bronchialis*. Branch, in 1907, confirmed Castellani's observations in the West Indies, and Jackson, in 1908, in the Philippine Islands. In 1909 Waters recorded several cases in India, and Phalen and Kilborne a case in the Philippine Islands, where, in 1911, Chamberlain described two further cases. More recently numerous cases have been observed in various parts of Africa by Chalmers, O'Farrell, Taylor, Harper, and others. Of special importance is the recent very complete work on *S. bronchialis* carried out by Fantham.

Synonyms.—Castellani termed the affection which he described bronchial spirochætosis; at the present time it is also known as bronchial spiroschaudinniasis, Castellani's bronchitis, Castellani's spirochætosis, Castellani's disease. The last two terms



Spirochæta bronchialis.

are not to be recommended for general adoption as "Castellani's spirochætosis" is a term applied, especially by French authors, to yaws; and "Castellani's disease" causes confusion, so many other maladies, such as endemic funiculitis, febris columbensis, tinea flava, tinea nigra, tinea intersecta, ulcus infantum, copra itch, dermatitis nodosa rubra, lichen convex, keratoma plantare sulcatum, &c., having been described by this observer. The terms which seem to me should be preferred are: "Castellani's bronchospirochætosis" or "Castellani's spiroschaudinniasis," as either of these names gives a clear idea of the nature and etiology of the malady, and embodies the name of the observer who first described the condition.

So far cases have been recorded from Ceylon, India, Philippine Islands, China, West, East, South and North Africa, West Indies.

It is probable that Castellani's broncho-spirochætosis is a cosmopolitan disease.

Etiology.—The disease is caused by *S. bronchialis* Castellani. Castellani, in his first publications, called attention to the great morphological variability of the germ, which might have suggested the

existence of several varieties or species of it. The recent very complete investigation of Fantham has clearly shown that the term covers only one species, which is very variable in length, thickness, &c. I can confirm Castellani and Fantham's observations. In my case the expectoration, which was rather scanty and mucopurulent, was collected in sterile Petri dishes after the patient had thoroughly gargled her throat with sterile water and had spat out as much saliva as possible. Preparations were stained with Giemsa and Wright. In all the preparations very numerous spirochætes were found, but often some of them did not take the colour well. There is no doubt that *Spirochæta bronchialis*, Castellani, is very variable in length, thickness, and the number of waves; in my case its length varied between 5 and 30 microns; its breadth between 0·2 micron and 0·6 micron; the number of waves between two and eight. One may distinguish thick and thin forms, long, short, and intermedial types. The ends are of variable shape, but mostly tapering; flagella have not been seen by me, but a membrane or "crista" may be observed in certain specimens. I can confirm Fantham's observation of the coccoid stage of the parasite. I have often observed strings of coccoid bodies with spiral outline.

Symptomatology.—Castellani described three types: the acute type, the chronic type, the subacute type.

In the *acute type* the patient feels chilly and then develops fever, which generally lasts from five to six days. The temperature is seldom very high, and rarely exceeds 103° F. The expectoration is scanty, of a mucous or muco-purulent type, and as a rule does not contain blood; the general condition is in some cases not much affected; in others the patient feels very tired and ill and complains of severe headache and rheumatoid pains all over the body.

Chronic bronchospirochætosis may follow an acute attack, but often the onset is insidious and slow. The patient complains of chronic cough with muco-purulent expectoration which may be slightly bloody. Sometimes attacks of true hæmoptysis are observed, some pure blood being expectorated. The temperature may be normal or there may be fever of a hectic type. Castellani has observed a case showing a temperature chart somewhat resembling a mild case of undulant fever. In many cases the physical examination of the chest reveals very little except a few râles, but in certain cases signs of consolidation, &c., may be present. The general condition may remain fairly good for a long time. A few cases, however, waste rapidly. The course may be a very prolonged one, extending to several years, with periods of great improvement and apparent cure.

A third group of cases have a *subacute* course, and to this group belongs mine, of which I may here give a short account:—

Mrs. M., a Greek lady, aged 24, residing in Uskub, Serbia, since two years, came to the American Clinic complaining of cough with rather scanty muco-purulent expectoration. These symptoms had begun, according to her statement, six weeks previously. She was somewhat anæmic and her general condition was rather poor. At the time of examination her temperature was normal, but she stated that at night she occasionally felt feverish. Examination of the chest revealed nothing important except a few moist, rather coarse râles at both bases. Some expectoration was collected and examined for tubercle bacilli with negative results. In preparations stained with Wright and Giemsa numerous spirochætes were present. The expectoration was afterwards collected many other times after the patient had first gargled with sterile water; spirochætes were always present in large numbers, as already stated under the heading *Etiology*. The diagnosis was confirmed by Dr. Castellani. Guinea-pigs inoculated with the sputum did not develop tubercular lesions. The patient was treated with arsenic (liq. Fowleri) and pil. glycer. co. with good results, the condition rapidly improving within three weeks, and the spirochætes practically disappearing from the expectoration, which almost completely ceased.

Relapses.—According to Castellani, relapses are fairly common.

Complications.—Rhinitis has been observed, and pneumonia has been noted.

Mixed Infections.—Cases of mixed infection, bronchial spirochætosis and tuberculosis have been observed by Branch and Castellani. The latter author has observed also cases of bronchomycosis and bronchospirochætosis.

Diagnosis.—This is based on the microscopic examination of the expectoration, which must be collected as free from saliva as possible. The condition is differentiated from tuberculosis by the absence of Koch's bacillus, from bronchomycosis by the absence of fungi, and from endemic hæmoptysis by the absence of the ova of *Paragonimus westermanii.*

Prognosis.—In acute cases the prognosis is favourable, but if the patient is careless and leaves hospital too soon, he may have repeated attacks and the disease may become chronic. In those cases which begin with a slow insidious onset the prognosis if favourable, *quoad vitam*, but the course of the disease may be extremely long, Castellani having recorded cases of five and seven years' duration, and there may be wasting and severe anæmia.

Treatment.—Castellani first called attention to the beneficial effect of arsenic in the disease; the drug may be administered as liq. Fowleri, or ac. arseniosi by the mouth, or in the form of cacodylates subcutaneously. In cases with much expectoration he advised combining the arsenical treatment with balsamics and glycerophosphates. I have treated my case with liq. Fowleri ♏ iij t.d., and pil. glycer. co., of the United States Pharmacopœia, with satisfactory results.

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CASE OF MALARIAL FEVER WITH MOTOR PARALYSIS OF THE LEGS.[1]

By Dr. WM. HAUGHTON HEARD.
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THE following notes may prove of interest to the profession, as indicating a type of malarial infection of an unusual nature, but which is occasionally met with, in which the local symptoms form the prominent feature of the case to such a degree as to obscure the diagnosis until microscopic examination has placed the matter beyond doubt.

Patient, a native Government porter, was admitted to hospital at Eldoret on May 3, 1915, apparently about the fifth day of his illness.

Previous History.—A porter engaged in carrying loads, he was returning empty-handed to Eldoret, one of a party, a journey of about sixty miles. He complained first of illness whilst on the road. When half the journey was completed he was seen by a European constable at an outlying station.

The constable's description was that he was struck by the man's staring appearance, and imagined he was dealing with a case of insanity. He administered salts and ordered him to be taken at once to hospital.

Shortly after resuming his journey the native police, in whose charge he was travelling, observed that his gait was becoming staggering, and from then onwards found it necessary to support him on either side, as he could no longer, unaided, maintain an upright position.

Although unable to walk or stand upright, he retained complete control of both bladder and bowels. His appetite was, if anything, increased. His speech was unaffected, he speaking occasionally and distinctly.

Condition on admission to hospital on May 3, 1915. Patient, a well-built native of about 25 years of age, was seen by the sub-assistant surgeon. Complete inability to walk or stand was his most pronounced symptom; eyeballs appeared prominent. No replies could be obtained to any questions. Physical examination showed temperature normal. Tongue moist and slightly furred. Pulse regular, but rapid and weak. Internal organs apparently normal. Spleen enlargement doubtful. Calomel gr. iv was administered, followed by a saline draught. Blood specimens were taken and forwarded to the Government Bacteriologist, Dr. Ross, at Nairobi, for report.

May 4, 1915, morning temperature 101° F. Bowels had acted freely, and nourishment been well taken. His general condition was much the same as overnight. Tentative treatment of quinine hyd. gr. v every four hours was administered. Next day, May 5, I saw the patient for the first time. As before, no replies could be elicited to any question, though native attendant stated that he spoke occasionally.

At the time of my visit a slight shivering fit was present. Temperature 101·6° F. Respirations practically normal. Pulse regular and good; slightly above normal. Slightly staring look, but no protrusion of eyeballs.

Tongue moist and slightly furred. His general appearance and condition did not in any way indicate a dangerous condition. He swallowed food readily.

Examination showed motor paralysis of both legs, he being quite unable to stand upright even with support. The leg muscles were sound, with no signs of degeneration or wasting.

Sensation, so far as could be judged, was normal. He had free use of both arms.

Pressure along the spinal cord produced no sign of tenderness or pain. The head and neck were freely movable.

Reflexes showed exaggerated patellar reflexes. No plantar reflex elicited, and no ankle-clonus. Both bladder and bowels were normal. The internal organs were, as far as ascertainable, quite normal.

The lesion of whatever nature appeared to affect the anterior motor nerve roots in the lumbar region.

The youth and apparent sound physique of the patient, the acute onset of the illness, combined with slight shivering fit, and intermittent temperature, were vaguely suggestive of malaria.

Failing any definite diagnosis at the moment I ordered quinine gr. x (ster. sol. bihydrochl.) to be administered hypodermically, followed by quinine gr. v. in solution by mouth every four hours; the effect to be watched and ampoule repeated next morning if any improvement took place.

May 6, 1915.—The effect of treatment most marked and decided. Temperature and pulse normal. Patient speaking of his own accord, and able to draw up his legs in the bed when requested. Facial expression normal and appetite good. Quinine ampoule gr. x repeated and solution by mouth continued.

The next day he was able to stand a little on trial. Ampoule gr. x repeated on 8th and again on 10th, his improvement being rapid and uninterrupted; his leg power being practically restored by the 10th. Solution of quinine gr. v by mouth thrice daily was maintained up to the 15th.

A small gluteal abscess necessitated his retention

[1] Forwarded for publication by the courtesy of the Secretary of State for the Colonies.

in hospital until the 27th, when he was returned to duty fully recovered.

The report very kindly forwarded to me by Dr. Ross, to whom my thanks are due for his kind interest in the case, and assistance in definitely settling the diagnosis of malaria, was such as to leave little doubt in the matter.

He reported the presence in the blood of crescents and malarial rings of exceptional clearness and due to acute malarial infection. A point of further interest was the extreme mildness of the usual general symptoms which accompany a malarial attack, in comparison with the serious nature of the local manifestations.

THE PLAGUE SITUATION IN NEW ORLEANS.

AFTER a lapse of nearly a year a case of human plague occurred in the city of New Orleans, August 27. This case was confirmed as true bubonic plague on September 8. The epidemiologic investigations as to the exact source of the infection have not yet been completed, but it is believed that it was probably received in the city of New Orleans. The occurrence of this case demonstrates the difficulties surrounding the eradication of the disease and also points out to other cities the necessity for ridding themselves of the rodent carriers of the disease and of thoroughly rat-proofing all of their buildings. No fear is felt that this case will be followed by an outbreak. Officers and men of the Public Health Service, well trained in the control of the disease, are on the ground and with the health authorities of the city of New Orleans are taking every precaution to prevent the spread of the disease from the city and within it. During the three months from July 17 to September 18, the United States Public Health Service, in its work against bubonic plague in New Orleans, fumigated 118 vessels with sulphur, 144 with carbon monoxide, and 15 with hydrocyanic acid gas; and issued 345 clean bills of health and 54 foul bills of health. In the department of field operations 56,233 rats were trapped, 101,226 premises were inspected and 7,281 buildings were rat-proofed. The department of laboratory operations received 7,281 specimens of *Mus rattus*, 13,988 of *M. norvegicus*, 1,090 of *M. alexandrinus*, 38,915 of *M. musculus*, 466 wood rats, 308 musk rats, and 842 putrid rats. In all, 56,160 rats were received at the laboratory. Of these, 18,605 were examined, 169 were found suspicious and in seven rats the diagnosis of plague was confirmed. During the week ended July 24, one suspicious human case was inspected and another during the week ended August 28, and one human plague case was discovered as reported above. Since the initiation of the work against plague in New Orleans, 44,938 buildings have been rat-proofed, and 442,497 rodents have been captured, of which 286,087 were examined. Rodent plague was found in four cases in *M. musculus*, in seventeen cases in *M. rattus*, in eight cases in *M. alexandrinus*, and in 222 cases in *M. norvegicus*.

Notices.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 1, 1915.

TYPHUS FEVER.

So long have we in England, and in London in particular, been practically free from typhus fever that we have lost the clinical evidence and faculty by which we can recognize its presence. There may be cases of typhus occurring amongst us which may not be diagnosed, but they must be rare indeed.

How different to fifty, nay forty, years ago in London, when the "three-week fever" so frequently mentioned by the out-patients at our hospitals was fairly common—and when we go back to the early sixties of last century it was very com-

mon. Ever since 1866, when the famous Commission on Overcrowding was instituted, typhus fever in London has been on the decrease, until to-day many a medical man of, say, 50 years of age may tell one that he has never seen a case. But what is true of London is not true of the country generally. Still in several towns we hear of outbreaks of typhus, and of cases of typhus in others; in lonely cottages on the western sea-coast of Ireland, where fresh and undiluted breezes from off the Atlantic Ocean prevail, there occasionally typhus has of recent years occurred amongst the inmates.

Evidence by medical men with the several armies in Europe now at war as to the presence of typhus fever amongst the soldiers is universal. It may be that in the earlier days of the War reports were exaggerated, and chiefly inadvertently, owing to the fact that newspaper reporters and others got confused between the terms "typhus abdominal" (so commonly applied to typhoid fever on the Continent), and typhus itself. The itinerant collector of news overhears, perhaps, a conversation between two doctors, and as the word "typhus" occurs again and again, he, in his haste, puts it amongst his news items that typhus is present amongst the troops at —— and ——. Had he listened to and understood the qualifying word "abdominal," he would have telegraphed to London that typhoid, not typhus, prevailed. The correctness of the old terms gaol fever and camp fever as synonyms for typhus was never better illustrated than it is to-day. From field camps, and from prisoners' camps especially, epidemics have been reported and a serious death-rate recorded.

There is practically nothing new to tell as regards the signs and symptoms of the disease; the men of a generation ago were astute observers, and have given us a clinical picture of typhus which will endure. In the light, however, of recent discoveries it is well to have a record of the present-day phases of a disease unfamiliar to many amongst us.

The epidemiology of the disease is to-day the subject of moment. How and by what medium is infection conveyed? is the thought uppermost with every medical man, and it is the epidemiologist and the bacteriologist who will settle the point.

Several observers have found what they hold to be a specific germ, but unfortunately these germs differ so widely that we cannot accept as yet anything as proven. But to-morrow this may be found; or, on the other hand, the filter may be blamed for its coarseness in not staying the passage of these organisms; or, yet again, it may be that a germ-produced toxin is the cause, and that no organism is discoverable. Be the germ found or not, there is a very strong belief that the body or clothes louse, the *Pediculis corporis*, is the transmitter of the disease. Other vermin may also take part, but nothing is known of their doing so. The evidence in this direction is, however, only clinical, but until a parasite of typhus is known and recognized, clinical observations, combined with experimental work, may be accepted as sufficient scientific proof of the louse as the transmitter of the disease. Yellow fever and its spread by a mosquito is an illustration of an accepted fact when no parasite is to be found. and the finding of an organism would not add to nor alter the story of transmission.

The conception of a slowly moving verminous animal being the means by which typhus is carried is in accordance with our knowledge of the infectivity of typhus. It is not the visitor who merely walks through a ward full of typhus fever who gets the disease, but it is the doctor, or the clinical clerk, or the nurse, who spends some time with the patient, who has to raise the patient and come into close contact whilst percussing an organ or listening to the chest. Nurses and orderlies are especially liable to infection, seeing how constantly they are in contact with the patient, feeding and washing him, making the bed, &c. Close contact is essential to infection in typhus as in leprosy, another louse-spread disease; but in the former, seeing overcrowding is always present, whereas in leprosy isolation is the rule, the infection in typhus is wide and rapid, whereas in leprosy it is limited to a degree.

"The Clinical Records of Typhus," by Major P. C. T. Davy and Captain A. T. Brown, gathered at a prison camp in Germany and published in the *British Medical Journal* of November 20, 1915, are especially interesting. We are so unaccustomed to meet with clinical records in modern medical literature that their story is especially welcome. Microscopes and laboratory apparatus were beyond their reach, yet have they given us a renewed example of what pure observation means, and how much we can still learn, as our forbears wholly did, from close and accurate attention to signs and symptoms and epidemiological evidence.

In the paper there are several facts especially noticeable amongst a great number of interesting details.

(1) The observation that lice swarmed everywhere in the camp, that there was a singular immunity from other parasites—for they never once saw fleas or bugs—seems to bring home the case against the louse of being the transmitter of the infection.

(2) The element of insufficient food and malnutrition at the present day, as in older records, is not wanting in the evidence before us as contributory to the presence of typhus. The example of diet as supplied to prisoners, given by Drs. Davy and Brown, enables one to understand their debilitated state: (*a*) Early morning, a black liquid which claims to be coffee, accompanied by a slice of bread (about 9 oz.), which forms each man's daily allowance; (*b*) midday, soup made with meat, barley, potatoes, or preserved vegetables, and a suggestion of meat or fish, in all about two pints; (*c*) evening, soup as above.

(3) The opportunities of washing and bathing were few, many men waiting for more than a month—some nearly three months—for a bath.

(4) Overcrowding. In the barrack rooms, where 300 men were lodged, the cubic space was 210·87 cubic feet per head. The warmth was obtained by a closed stove, so that the men lived in an atmo-

sphere of fœtid warmth. In the hospital ward more space per head was allowed, but even here there was overcrowding to a degree.

The actual accounts of the disease show that the incubation period may extend to two weeks, as a rule, but occasionally even to three. The eruption develops on the fifth day and is occasionally polymorphic. The classic term "mulberry" applied in text-books to the typhus rash is not so apt as it might be; the macules, after twenty-four hours, become hæmorrhagic, rendering them of a reddish-coppery colour, and die off into copper-stained patches, which endure from three to five days. The feverishness lasts about fourteen days, justifying the popular name given to typhus when it was prevalent in England of the "two-week fever," just as the names "three-week fever" and "four-week fever" were given to a twenty-one days or twenty-eight days typhoid.

Of the complications, cough and pulmonary congestion, otitis media, suppuration of the parotid, degenerative condition of the heart muscle, bedsores, albuminuria, and peripheral neuritis and, of course, delirium, were the more common; but in the majority of cases the disease ran an uncomplicated course.

The mortality in the 2,000 cases observed by Drs. Davy and Brown amounted to 15 per cent. This is a lower average than was the rate in other epidemic centres in German prison camps. As regards treatment, these observers naively remark: "Force of circumstances condemned our patients to starvation diet, and they did well on it." Medication was limited owing to the absence of drugs. Morphia administered hypodermically was regarded "as a sheet anchor in most cases, and we never had cause to regret its use."

J. C.

Abstracts.

EXPERIMENTS ON THE DISINFECTION OF TUBERCULOUS SPUTA WITH A ONE PER CENT. SOLUTION OF ANIODOL.

By A. Raybaud, M.D.
Marseilles.

Introduction.—Ever since the discovery of the tubercle bacillus, scarcely a day has passed without a new remedy being proposed, such as a serum, vaccine, or drug, for diminishing tuberculosis. The long list of these means which could be drawn up would be tedious and profitless, for up till now no means was known of successfully overcoming tuberculosis, which is a chronic infectious disease having a preference for those who are physiologically of feeble constitution, ending in consumption. The problem to be solved was, therefore, to find a medicament having powerful antiseptic properties against the tubercle bacillus and its toxins, that is to say, by destroying them without harming the vital cells, which on the contrary it should strengthen by stimulating phagocytosis, so as to enable them to overcome the chronic intoxication caused by the bacillary secretions and, at the same time, to overcome the organisms. The experimental researches carried out against the sterilization of tuberculous sputum by aniodol has given such satisfactory results, as the following article will show, that the claims of this substance deserve careful trial and attention. As the consequence of these experiments, therapeutical researches were tried on patients in France in cases of primary and secondary tuberculosis, and gave very satisfactory results to eminent doctors, including Professor Pitres, of the Medical Faculty at Bordeaux, and many others who, although less known, nevertheless compel attention. Aniodol taken in the amount of 50 to 150 drops daily in three or four doses, well diluted in milk, tea, or other liquid, completely realizes the desiderata above expressed.

The sputa were spread into wide-necked bottles, and an approximately equal volume of the antiseptic was added; this caused a strong coagulation of the mucus and purulent parts of the sputa. After a variable period of contact, the sputa were washed with sterile distilled water; a portion, by preference the central and thick parts, was then well disintegrated and injected into guinea-pigs. The sputa contained many tubercle bacilli. Three series of inoculations were carried out, after six, twelve, and eighteen hours' contact.

First Series of Experiments.

(i) *After six hours' contact.*—Three guinea-pigs were inoculated, and forty-three days after inoculation were killed; two had tuberculous peritonitis with large caseous nodules and tuberculosis of the viscera. The other animal had an abscess at the point of inoculation and caseified glands; tubercle bacilli were identified microscopically from all the animals from pus taken from different places.

(ii) *After twelve hours' contact.*—Three guinea-pigs were inoculated: one died accidentally twenty-four hours after inoculation. A *post-mortem* examination did not reveal any signs of tuberculous lesions; the peritoneum, glands and organs were normal; the intestines were filled with a diarrhœic liquid. A microscopic examination of a section of the spleen did not show any tubercle bacilli. The remaining two guinea-pigs were killed forty-two days after the inoculation; in one there were no lesions, nor were any bacilli found by microscopical examination of the mesenteric and inguinal glands. In the other animal there was a fibrous scar at the point of inoculation; there was no pus or glandular retention, nor were any bacilli found microscopically.

(iii) *After eighteen hours' contact.*—Three guinea-pigs were inoculated; two died within twenty-four hours. The *post-mortem* examination was not made, but the cause cannot be assigned to tuberculosis. The third animal was killed forty-two days after the inoculation; there was a scar at the point of inoculation, but no lesions. Three more guinea-pigs were inoculated; one was killed sixteen days

after inoculation; there was a tuberculous abscess at the seat of inoculation, and a caseous gland of the corresponding side; tubercle bacilli in two places; no generalization. The second guinea-pig died thirty-three days after the inoculation; there was general tuberculosis, especially in the spleen, and microscopical examination of sections of it showed tubercle bacilli. The third guinea-pig was killed forty-three days after inoculation; general tuberculosis was found, especially pulmonary, with miliary granulations in the liver and spleen. In the two latter cases there was rather general infiltration of miliary tuberculosis in place of the large caseous masses in the six hours' experiments. A series of experiments were carried out with sputa treated with the antiseptic for six, twelve, and eighteen hours. It was found that the bacilli preserved their morphological aspect and their particular mode of reacting with colouring and decolorizing reagents. They are fixed and sterilized, but not destroyed.

Second Series of Experiments.

(i) *After six hours' contact.*—Three guinea-pigs were inoculated. Two were killed fifty days after the inoculation; generalized tuberculous lesions were found, together with miliary granulations of the peritoneum, tubercles, spleen and lungs. The third died forty-nine days after with a large abscess at the point of inoculation, caseous degeneration of the inguinal, pre-vertebral, and tracheo-bronchial glands and tubercles on the spleen. For some days there was a marked pathological condition of the inguinal lymphatics.

(ii) *After twelve hours' contact.*—Three guinea-pigs were inoculated. One died twenty-six days after; a *post-mortem* examination did not show any tuberculous lesion of the peritoneum, neither of the glands nor of the viscera. The other two animals were killed thirty-four days after; no lesion was found.

(iii) *After eighteen hours' contact.*—Three guinea-pigs were inoculated. None of them showed any glandular or visceral lesions, nor were any bacilli found. Three animals were also inoculated as blank experiments; two died thirty-one days after, and were very thin with generalized tuberculous lesions. By microscopical examination tubercle bacilli were found in all the sections of the organs; the third animal died twenty-five days after the inoculation; the inguinal glands were very voluminous and an abscess formed at the point of inoculation; there was generalized tuberculosis with caseification of the inguinal and pre-vertebral glands and miliary granulations of the spleen, liver and lungs.

Third Series of Experiments.

(i) *After eight hours' contact.*—Three animals were inoculated and killed after forty-five days. No tuberculous lesion was found.

(ii) *After ten hours' contact.*—Three animals were inoculated. One died soon after owing to the intestine being pierced with the injection needle, which set up acute peritonitis. The second had some caseous nodules at the peritoneum and spleen; sections of these organs contained tubercle bacilli. In the third there was a very marked tumefication at the point of inoculation. Pus taken from this showed the presence of tubercle bacilli; no general or glandular generalization.

(iii) *After twelve hours' contact.*—Three animals were inoculated. They did not show any signs of ill-health and after forty-five days were killed and found to be all quite healthy.

Three animals were also inoculated as blank experiments. One died twenty-one days after, very thin and had generalized lesions of experimental tuberculosis. The second had a large abscess at the point of inoculation. When killed after forty-five days there was glandular and generalized visceral infection; caseification of the corresponding inguinal glands and the pre-vertebral glands in the lumbar region, infiltration of the abdominal and thoracic glands, parietal and visceral peritonitis, miliary tuberculosis of the spleen, liver and lungs.

Fourth Series of Experiments.

(i) *After eight hours' contact.*—Three inoculations. One was killed after forty-two days, and had adhesions of the epiploon at the point of inoculation, and large pre-vertebral glands; five caseified nodules in the liver and two in the spleen. The examination of the caseous pus of the visceral centres did not show any tubercle bacilli. The second animal, killed after eighty-three days, did not have any tuberculous lesion; the pre-vertebral glands were very hypertrophied but non-caseous, and their sections did not contain any tubercle bacilli. The third guinea-pig was killed after forty-two days and did not have any lesion.

(ii) *After ten hours' contact.*—Three animals were inoculated and killed after forty-two days. None of them showed any lesions. Two guinea-pigs were also inoculated as blank experiments. One died thirty-one days after with a voluminous abscess at the point of inoculation and glandular generalization. The other was killed after forty-two days with miliary tuberculosis of the peritoneum with a serous fluid, some large tubercles on the spleen, one on the kidney, and a liver of a cirrhotic aspect. The experiment may be summarized as follows:—

Hours' contact.	Animals inoculated.	Became tuberculous.
6	6	6
8	6	1
10	6	2
12	9	0
18	6	0

After six hours' contact all the inoculations were positive; the sputa were not at all sterilized; there was a slight diminution of virulence. After eight hours' contact a reaction was caused in all the guinea-pigs: loss of weight, glandular hypertrophy, but the majority resisted the infection successfully and caused phagocytosis of the bacilli. Only one out of six acquired a very attenuated form of tuberculosis.

After ten hours' contact, very virulent sputa infected two guinea-pigs in a very attenuated form, in the peritoneum and as a localized infection, without generalization in the animal subcutaneously inoculated. The sputa after ten hours' contact did not cause any lesion. After twelve hours' contact the most virulent became sterile and absolute. None of the nine guinea-pigs inoculated showed the slightest tuberculous lesion. *A fortiori* after eighteen hours'contact the sputa had lost all virulence. One can therefore conclude:—

After six hours, attenuation practically inappreciable.

After eight and ten hours, possible sterilization of not very virulent sputa, but this is uncertain.

After twelve hours, certain and constant sterilization.

FIFTH ANNUAL REPORT OF ROCKEFELLER FOUNDATION.

THE report, covering the period to the end of 1914, deals with the activities of the international Health Commission. The Commission had assigned to it two tasks: to extend to other countries the work of eradicating hookworm disease, and to follow up, as far as practicable, the treatment and cure of this disease, together with the establishment of agencies for the promotion of public sanitation and the spread of the knowledge of scientific medicine. The hookworm infection includes practically all countries within the zone from 36° North to 30° South latitude, and about 900,000,000 of the 1,600,000,000 inhabitants of the globe live in countries where the infection is prevalent. In the southern states, 39 per cent. of the 548,992 rural children microscopically examined were found to be infected; 90 per cent. of the population of the United States of Colombia, living between sea level and an altitude of 3,000 ft., are infected; 50 per cent. of the population of British Guiana is infected; 90 per cent. of the population of Dutch Guiana; 50 per cent. of the labouring population of Egypt; 50 per cent. of the coolies in Natal and 90 per cent. among the plantation labourers in Ceylon are victims of the disease, and in some parts of India and among the coolies on the estates in Malaysia and Fiji, which import their labourers from India, there is a large percentage of infection. The southern two-thirds of the Chinese Empire is infected, the infection of the farm population in the Yangtse Valley running as high as 76 per cent. The relief and control of the disease involve first a survey to determine the geographic distribution and approximate degree of infection; the microscopic inspection of the people and the cure of the infection, and the setting in operation and making effective such sanitary measures as will stop soil pollution. During the first year of the existence of the Commission, trips for preliminary examination and conference were made to England, the British West Indies, Egypt, and the British dependencies in the Far East and to Central America. As a consequence of these visits, work has begun in British Guiana, Antigua, Trinidad, St. Lucia, Grenada, Egypt, Ceylon, the Malay States, Panama, Nicaragua, Costa Rica, and Guatemala. In addition to this work in foreign countries, the Commission has also undertaken to complete the programme of the Rockefeller Sanitary Commission for the eradication of uncinariasis in the southern states. The methods pursued include work under authority and direction of the Government which was begun on a small scale; the treatment of those found infected; a survey of the geographic distribution of the infection; preventive measures and education of the people, the whole being designed as an object lesson in the treatment of disease, demonstrating that as one disease has been conquered others may be.

Personal Notes.

INDIA OFFICE.

From September 14 to October 26, 1915.

Permitted to Return.—Major F. S. C. Thompson, I.M.S.; Lieutenant-Colonel F. W. Gee, I.M.S.; Lieutenant-Colonel E. C. Hare, I.M.S.; Lieutenant Colonel F. E. Swinton, I.M.S.; Colonel D. S. J. Grant, I.M.S.; Major W. A. Justice, I.M.S.; Captain J. McD. Eckstein, I.M.S.

Arrivals Reported in London.—Captain J. J. Harper-Nelson, I.M.S.; Lieutenant A. E. Hamlin, I.S.M.D.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Clark, Lieutenant Colonel W. R., I.M.S. Punjab, 9 m., March 18, 1915.

Justice, Major W. A., I.M.S., Ms., 12 m., November 30, 1914.

Long, Major, W. C., I.M.S., Ms., 11 m,, January 9, 1915.

Melville, Lieutenant-Colonel, H.B., I.M.S., Delhi, 23 m., April 1, 1914.

Morgan, Major E. J., I.M.S., U.P., 24 m., October 1, 1913.

Nutt, Major H. R., I.M.S., U. P., 19 m., March 31. 1914.

Robb, Major J. J., I.M.S.. Mis. Jails Dept., 15 m., August 12, 1914.

Robertson, Major J. C., C.I.E., I.M.S., India Sanitary Commission, 8 m., April 14, 1915.

Sandes, Captain J. D., I.M.S., Bl.

Thompson. Major F. S. C., I.M.S., Bl. Jails., 13 m. 25 d., September 19, 1914.

Webster, Lieutenant-Colonel, C. G., I.M.S., M. Hospitals. 30 m., July 29, 1913.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment or Department, and the Period for which the Leave was granted.

Extensions of Leave.—Captain E. R. Armstrong, I.M.S., 3 m., M. C.; Lieutenant-Colonel W. R. Clark, I.M.S., 3 m., M.C.

Armstrong, Captain E. R., I.M.S., to January 21, 1916.

Dawson, Lieutenant-Colonel A. W., I.M.S.

Nelson, Captain J. J. H., I.M.S.

Thomson, Lieutenant-Colonel G. S., I.M.S., to November 23, 1915.

Wilson, Lieutenant J. D,, I.M.S., to Jan. 16, 1916.

Original Communications.

HERPETOMONADS AND VERTEBRATES: A CORRECTION OF A RECENT CONTRIBUTION ON "LEISHMANIA PROBLEMS."

By H. B. Fantham, M.A.Cantab., D.Sc.Lond.

Lecturer in Parasitology, Liverpool School of Tropical Medicine.

Much trouble has accrued in the past from lack of care in reading what has been written with respect to a subject, from the separation of sentences from their context and also from partial quotation. It is regrettable that a recent communication[1] by Mr. Wenyon on the subject of "Leishmania Problems" contains each and all of these faults. It has degenerated into a mere personal attack on a previous author (myself), who deplored the "destructive criticism" of which Mr. Wenyon's present paper, as well as some of his former papers, prove him a master. In this respect I have the honour of accompanying Miss Porter, Major Patton, Professor Stephens, Dr. Macfie, and others who have been similarly misrepresented and often personally attacked by Mr. Wenyon. My paper, on the other hand, was impersonal—the *rôle* of certain insect flagellates in the evolution of disease being considered.

I can only deal with a few of the many misstatements, irrelevancies, assumptions, and remarks that can only be regarded as examples of false suggestion made, perhaps unwittingly, by him. Naturally, I am labouring under disadvantages in that (1) my original paper[2] was not published in this Journal, and so is not accessible to my readers at first hand; (2) I am not a medical man, though associated with the medical profession all my working life, in teaching them biology and parasitology; and (3) it is necessary to reply at once—it is now five months since my article appeared—and I have not therefore the advantage of time.

Mr. Wenyon contradicts many statements that I have not written, while fully admitting others that I have written, without, however, my receiving credit for the same at his hands. I do not intend to enter into a discussion with him, but in the main merely desire to point out regrettable inaccuracies.

I would state that there is no "outburst of feeling" at all in my paper. I am well aware of the work of a few brilliant medical men in the domain of protozoology, but "exceptions prove (or probe) the rule." I stated that "in the main" the zoological knowledge of medical men was restricted, and no one will deny that among some possessing it the outlook is narrow. Mr. Wenyon has kindly supplied an example by using the elegant term "trypanosomology," whereby, apparently, the study of trypanosomes is exalted into a separate science. He gives a list of certain medical men brilliant in protozoology, ignoring the fact that an equally imposing list of zoologists, brilliant in the same sphere, could be produced.

My critic devotes much attention to the introduction of my paper. In it I endeavoured also to point out the need for protozoology—at any rate, in its morphological aspect—being left to zoologists who have made a study of zoology and comparative anatomy. This need was never greater than at the present, when protozoal dysenteries occur in the Eastern theatre of war, and zoological diagnosis would greatly reduce the work of medical men. However, this is a digression.

Gratuitous assumptions abound in Mr. Wenyon's paper. They include statements such as that (1) I do not know that certain workers whom I quoted were medical men; (2) that I give my blessings to them—mere "journalese" of a childish order; (3) that I have merely followed in the footsteps of certain medical men; (4) that my work is of quite recent origin, following that of Laveran and Franchini (a reference to a paper of mine read before the Royal Society in 1911, which the author partially quotes for other purposes, would show that my experiments began prior to that date); (5) that I have said that herpetomoniasis in animals was kala-azar—which I have not; (6) that my experiments showed that flagellates introduced into vertebrates were "necessarily natural parasites of vertebrates"—Mr. Wenyon's words, not mine; (7) that "dogmatic assertions" have been made by me—however, the said assertions are not specified, on the contrary, many suggestions will be found in my papers, which, through hurried and perhaps prejudiced reading by my critic, have been mistaken for dogmatism by him; (8) that I did not experiment before I wrote—on the contrary, my paper on *H. pediculi* (1911) contained reports of experiments with that flagellate on man and on rats, while before writing the paper of which he complains records were published of at least fifteen experiments done solely by myself on the introduction of herpetomonads and crithidia into various vertebrates. The experiments extended from 1910 to 1915, as is clearly indicated in the papers, which will be found in the *Proceedings of the Royal Society* and in the *Proceedings of the Cambridge Philosophical Society*. These facts should be known to Mr. Wenyon, and probably are, but, apparently, he has been blinded by partizanship. It is a pity also that exact references to literature are not set forth by him, and that he has not quoted a reference to his own paper in the Third Wellcome Report correctly, namely, p. 146, and not p. 246.

Dealing with certain of his statements seriatim, I would mention that the author widens the issue by making remarks on *general* progress in knowledge due to medical men. My paper dealt with a particular example, namely, leishmaniasis. Statements of fact are described by him as "pessimistic views"—the usual remark of those who dislike to face facts as they are. The remark that "if a satisfactory vertebrate host were discovered for the leishmania, we would not have to wait long for the solution of the leishmania problem" ignores the fact that though dogs have been known

[1] November 1, 1915, pp. 241-247, Journal of Tropical Medicine and Hygiene.

[2] See *Annals Trop. Med. and Parasitol.*, June 30, 1915, vol. ix, pp. 335-348.

for some years to be infected with kala-azar in the Mediterranean countries, yet the problem of leishmania remains unsolved.

Mr. Wenyon states that I said that the successful culture of leishmania did not advance matters, but suppressed my reasons, which immediately follow this statement, thus indulging in partial quotation. Nor does he indicate that earlier in my paper (p. 336) I state that the discovery of the flagellate stage of leishmania by Rogers in 1904 was of fundamental importance. It does not advance matters to assert that the search for a vaccine was the object of culture of the organism, because some vaccines have been obtained from certain bacterial cultures. No apparently successful vaccine of undoubted protozoal origin yet exists, and protozoa and bacteria behave very differently.

With respect to the value of speculation regarding which is the primary host of a digenetic parasite, I never denied that such were interesting, and my critic has suppressed the fact that on p. 338 I answer that question, stating that: "The answer is that each host has its own particular importance which must be carefully considered." That I considered the evolution of insect flagellates and their possible relation to disease is obvious, for it is incorporated in the title of my paper, and is specifically mentioned in my introduction and elsewhere.

The suggestion that I have considered that the infections due to insect flagellates introduced into vertebrates are "actual kala-azar in animals" is quite unwarranted. According to Euclid, the greater must include the less, and I have suggested that herpetomoniasis includes leishmaniasis, and that my experiments show leishmaniasis in the making.

The idea of my critic, published in 1913, to which he refers, that blood-inhabiting flagellates of the trypanosome group were originally parasites of the insect gut and that the insects acquired the infection from one another, is not new. Professor Louis Léger, a zoologist, put forward the same opinion in 1904, and others have followed him since. With regard to Mr. Wenyon's resurrection of the idea, of which Léger laid the foundation, I was present at the meeting of the Society of Tropical Medicine and Hygiene when he read the paper of which he has gratuitously considered that I have no knowledge, and moreover I possess a copy of the production. Further, other workers published the same ideas prior to Mr. Wenyon.

My critic states that he is "far from agreeing that the infections produced in animals by Laveran and Franchini, and which have been repeated and extended by Fantham and Porter, are in reality leishmaniasis." As my colleague and I have not stated that they are, we can only say that the matter need not have been discussed. Further, we have never stated that the flagellates introduced into vertebrates by us were "necessarily natural parasites of vertebrates." That flagellates of aquatic insects may become parasites of warm-blooded vertebrates is not considered so improbable as it appears to Mr. Wenyon. Recently Captain Archibald and others have considered this possibility, and the opinion of Captain Archibald is quoted by me on p. 347. He says, with regard to kala-azar in the Sudan, that "a more probable source of infection appears to be some intermediate host whose habitat is water." I notice that while my inoculation experiments are discussed by Mr. Wenyon, no mention is made of the results of my feeding experiments, although successful results were obtained when insectivorous animals, as well as others, were fed on flagellate-containing insects.

It is always easy to say what any experiment does not prove, but it does not advance knowledge. I have never stated that introduced "insect flagellates are already parasites of vertebrates," so that Mr. Wenyon's criticism of non-existent statements is merely waste of energy. I quite agree that "the truly scientific mind will withhold itself from dogmatism upon this point [free-living forms becoming parasitic or changing their type of parasitism] till sufficient proof has been produced." I have not dogmatized, but suggested. The only dogmatism in this matter of which I am aware is that of my critic in his series of misrepresentations. A more careful regard for the use of the English language will enable anyone who is unprejudiced to avoid the error of mistaking suggestion for dogmatism.

Again, no assumption that "the leishmania and flea flagellates are identical" has been made by me. No assumption having been made, there is no need to discuss the point.

A statement that is, at the least, inaccurate and ungenerous is made with regard to the time of my undertaking experiments: "Apparently not till Laveran and Franchini had shown him the way, when he undertook the comparatively easy task of repetition." Leaving aside the English of this sentence, its author surely should know that the results of my first experiments were read before the Royal Society in 1911 in a paper which he quotes later for another purpose. The possibility of them having been continued does not seem to have occurred to him. Also, he has not remembered that scientific workers in different countries can be working on the same problem at the same time unbeknown to one another, despite the historical examples of the parallel investigations of English and Italian workers on malaria and of English and German workers on Fasciola. Mr. Wenyon's wild generalization as to the state of the world's knowledge regarding insect flagellates at the end of 1912 is ludicrous.

Mr. Wenyon is even more unseemly in his statement, five pages later, that I "fail to realize that the observations were not in the first place original ones of his [my] own." I would inquire, then, whose were the observations that I published in 1911, and what right has he to assume that the work of my colleague and myself was merely imitative, considering also that we used very different hosts and flagellates from our French colleagues, and that we indicated the infective stages into vertebrates of the insect flagellates used? As honourable workers, we gave full credit to our fellow-scientists working in France, and while

naturally sorry that some of our results were forestalled, did not grudge them their well-deserved success. It may, however, be mentioned that neither we nor any English workers have the same facilities for rapid publication that are enjoyed by workers abroad.

The remark that I "failed to commence the experiments he blames others for not having undertaken" is inaccurate. As before stated, my earlier experiments were announced in 1911, and necessarily were begun some long time before that date. Other inaccurate references to my alleged lack of attempts at experimental work occur in the paper of Mr. Wenyon, but I do not think it necessary to repeat the references already given.

So far as my alleged change of views is concerned, I consider that the word change—at any rate as inferred by my critic—is inaccurate. I have not changed but extended my opinions, and on p. 339 of my paper is a statement proving this assertion. My statement is: "The occurrence of natural herpetomonads in invertebrates must not only be acknowledged, but it must be allowed that they may become pathogenic when introduced into vertebrates."

Again, the insinuation amounting to false suggestion that "the dogmatic assertion that the leishmania and flea flagellates are identical" has not been made by me. Further, I suggested that various insect flagellates hitherto regarded as distinct species were "physiological races," not "one and the same species," to use the wording of my critic. I have not dogmatically asserted that *Herpetomonas pattoni* of the flea and *H. pediculi* of the louse are one species, but that "probably only one species of Herpetomonas is concerned in adapting itself to life in vertebrates in different parts of the world. This species is known under various names. . . . These are probably merely physiological races of a herpetomonad, which is very like *H. jaculum*. . . . This herpetomonad under different conditions of environment produces pathogenic effects in very varying degrees in different vertebrates. It is also a flagellate which can probably live in invertebrates not already recorded as infected" (p. 345). It will be noted that these suggestions are far from dogmatic, though based on experimental results. The quibble with regard to the use of the term "specific" is only an example of the different stress laid on a term by different workers, but a specific parasite is quite capable of being a physiological race.

I decline to refute the somewhat sarcastic and dogmatic statement made that I created new species "without any experimental or other evidence." I only state that Mr. Wenyon has no evidence whatever on which to base this calumny.

A ludicrous blunder is made by referring to the "narrow curriculum of the zoologist." The medical man is concerned with one species of one genus of animals, *Homo sapiens*, and the greater part of his training is devoted to the study of man as man. The field of study of the zoologist is the whole animal kingdom.

My critic has evolved an idea of comparative methods of study that is not mine, nor can I be bound by his limited conception. Also, it has never been denied by me that study should be made of vertebrate flagellates with a view to finding out the possibility of their infecting insects. The matter, however, was not under discussion.

Another misreading is responsible for the strong remark that "a more inaccurate statement can hardly be conceived" than mine, that "though the discovery of Rogers was of fundamental importance, its application even to-day is only realized by two or three British and French workers." The records of the application of Rogers's discovery of the flagellate nature of leishmania to practical experience in preventive measures in the field are few and far between. I have given the best of them in referring to the preventive work in the Assam tea gardens (pp. 345, 346). Mr. Wenyon's interpretation is a very different thing. Again, the only person who has "imagine(d)" that I "had cleared up the whole question of kala-azar transmission" appears to be my critic.

A zoological error is made by Mr. Wenyon when he again reiterates his views with regard to the delimitation of the genera Herpetomonas and Leishmania. Difference in habitat does not create a difference of genus, an argument that my critic himself used against another protozoologist on a former occasion. Habitat is not a generic differential character, and hence his separation of herpetomonas from leishmania fails. Even though the original statement was written in 1912, it was as fundamentally wrong then as in 1915. The zoological conceptions of certain organisms held by some workers differ considerably from those of Mr. Wenyon, even though he has annexed the old genus Leptomonas of Saville Kent, 1882 (revived by Chatton and Alilaire, 1908), under the name of "my genus Leptomonas." A scheme of classification, again, surely cannot be considered to "still hold(s), though some members may have to be removed from one group to another." There are many criticisms that could be made of the classification set forth by Mr. Wenyon. This matter, however, is irrelevant to the author's criticism of my paper, in which such matters were not under discussion.

As a scientific worker, I repudiate the unseemly suggestion that I have not read Mr. Wenyon's paper in the *Arch. f. Protistenkunde* (1913). Neither did I state that it was a "lamentable contribution" nor "imagine" it to be so. If these are the author's feelings on the matter, he need not have imputed them to me.

Another instance of careless or misconstrued reading attaches to Mr. Wenyon's criticism of the remark that concludes my paper. *After* restating the excellent work of Rogers and Dodds-Price in Assam, I say that "it has remained for workers in laboratories in temperate zones, away from leishmaniasis material, again to point the way to preventive measures and to indicate the origin of disease." Ignoring the word "again" has led the

critic to an entirely wrong conclusion. My remark, obviously, was intended to draw attention to the results of Rogers and Dodds-Price in preventive measures, and to Rogers's ideas of viewing with suspicion flagellate-bearing insects. This suspicion may be deepened with regard to many insects and possible reservoir animals as a result of the experiments undertaken in France and England. The result of the removal of my sentence from its context has given it an altogether false significance in Mr. Wenyon's article.

Laveran's lack of success in infecting green lizards and geckos with insect flagellates is well known to Dr. Porter and myself, and is quoted in our paper in the *Proc. Camb. Philos. Soc.*, xviii, p. 145, where the results of Sergent and colleagues with cultures of gecko blood are also given. My colleague and I succeeded in infecting viviparous lizards with insect flagellates, a fact omitted by my critic.

Yet another statement that is inaccurate is that I have made "wholesale assumptions." What these assumptions are is not pointed out—probably because there is none. The author has confused suggestions on the one hand with assumptions, and on the other with dogmatism.

While Rogers's discovery of the flagellate nature of the Leishman-Donovan body certainly suggested that the parasite was insect-borne, it must be remembered that other workers have suggested infection by way of the digestive tract and by an intermediate aquatic host.

Throughout his "criticisms" the author has ignored the fact that a number of the experiments performed by Dr. Porter and myself consisted of feeding experiments. As to the inoculation experiments performed, every care was taken to ensure absence or reduction of bacterial contamination. He should be aware that many insect flagellates die out in the presence of bacteria.

A criticism has been made of my remarks regarding the flagellate forms described by Darling in *Histoplasma capsulatum*. Rocha-Lima and others considered that *H. capsulatum* is a Blastomycete, and that is so stated in my paper (p. 339), but so far as I can find, these workers have not explained the presence of the flagellate stages described by Darling from the spleen and lungs of the host. I drew attention to these flagellate forms, knowing well the frequency and possibility of mixed infections of organisms. I do not complain that "surprisingly little attention was paid to the discovery of *H. capsulatum*," in the words of my critic, but to the whole of Darling's discoveries, particularly the flagellate forms described by him—a very different matter, resulting from the separation of statement from its context. On p. 339 of my paper the Blastomycete nature of *H. capsulatum* is mentioned. The author's presumption that I still think that *H. capsulatum* is allied to leishmania is merely his own presumption. I am concerned only with the flagellate forms that Darling described, and which, apparently, some authors deem it convenient to forget or overlook.

The concluding series of inaccuracies and insinuations as to the originality of my work and ideas have been briefly indicated. They are unworthy of their author, and with that I leave them.

The final poetical imagery and derogatory remarks are no compensation for the irrelevant, inaccurate and often personal remarks in my critic's paper. The greater part of the subject matter of the paper criticized has been ignored or used in a manner leading to *ignoratio elenchi*. Poetical imagery may adorn the preacher's pulpit, but it is hardly convincing in the domain of science. The time devoted thereto would have been better employed in attending to grammatical construction, and in reading what has been written as it actually is written. Suggestions then would not have been construed as either dogmatic assertions or as assumptions, and the inexactitudes just noted would not have needed correction.

I should like to place before the readers of this JOURNAL the conclusions of two papers[1] written by me in collaboration with Dr. Porter. These conclusions, although clearly set forth in my paper which Mr. Wenyon criticized, were *not* quoted by him nor criticized adversely, for the very good reason that they did not abound in dogmatism or assumption and could not be easily removed from their context and subjected to misconstruction, of which my critic is so fond. From these conclusions it will be seen how our experiments compare with those of Laveran and Franchini, and that we have brought forward experimental evidence indicating the most infective stage of insect flagellates introduced into vertebrates, and that we have experimented with both warm- and cold-blooded vertebrates and not merely mammals.

The summary of the first paper was:—

"(1) Insect flagellates, *e.g.*, *Herpetomonas jaculum* (Léger) from *Nepa cinerea*, and *Herpetomonas ctenocephali* (Fantham), parasitic in the dog-flea, *Ctenocephalus canis*, can live inside certain vertebrates (*e.g.*, mouse and dog respectively) and can multiply therein. This we have shown experimentally.

"(2) If such flagellates be inoculated intraperitoneally, or are fed by the mouth in food, the flagellates can find their way into the blood-stream and internal organs (*e.g.*, liver, spleen, bone-marrow) of the vertebrate host.

"(3) The insect flagellates are pathogenic to the vertebrates experimented upon, producing symptoms like those of leishmaniasis (kala-azar).

"(4) The oval post-flagellate forms appear to be more capable of developing in vertebrate hosts than are other stages of the herpetomonad parasite of the insect.

"(5) It may be expected that the various leishmaniases, occurring in different parts of the world, will prove to be insect-borne herpetomoniases."

The summary of the second paper was:—

"(1) Herpetomoniasis can be induced in various warm- and cold-blooded vertebrates when the latter

[1] *Proc. Camb. Philos. Soc.*, xviii, pp. 39-50 and 137-148.

are inoculated or fed with herpetomonads occurring in the digestive tracts of various insects. The infection produced and the protozoal parasites found in the vertebrates resemble those of human and canine leishmaniases.

"(2) An infection can also be induced in certain vertebrates when they are fed or inoculated with *Crithidia gerridis*, and both flagellate and non-flagellate stages occur therein, but no transition to a trypanosome was found.

"(3) The following flagellata have proved pathogenic to warm-blooded mammals when the latter have been fed, or inoculated subcutaneously or intraperitoneally with them—*Herpetomonas jaculum*, *H. stratiomyiæ*, *H. pediculi*, and *Crithidia gerridis*. The hosts used were mice of various ages. That *H. ctenocephali* can infect dogs has already been shown by us.

"(4) *Herpetomonas jaculum* and *Crithidia gerridis* have also been successfully fed or inoculated into cold-blooded hosts, namely, fishes (*Gasterosteus aculeatus*), frogs, toads, lizards (*Lacerta vivipara*), and grass snakes (*Tropidonotus natrix*).

"(5) As we have previously stated, we believe that leishmaniases are arthropod-borne herpetomoniases, and that these maladies have been evolved from flagellates of invertebrates (especially herpetomonads of insects), which have been able to adapt themselves to life in vertebrates

"(6) In areas where leishmaniases are endemic, an examination should be made of all insects and other invertebrates likely to come into contact with men or dogs or rats and mice, in order to ascertain if these invertebrates harbour herpetomonads. Preventive measures should be directed against such invertebrates, especially arthropods. Further, it is likely that certain vertebrates, such as reptiles and amphibia (especially those that are insectivorous), may serve as reservoirs for leishmaniases or, as they should preferably be termed, herpetomoniases. From such reservoirs the herpetomonads may reach man by the agency of ectoparasites or flies, especially such as are sanguivorous."

Finally, the summary of my paper, portions of which were criticized by Mr. Wenyon, is as follows:—

"The significance of the herpetomonad stage of leishmania, of the recent announcements that such stages occur in man, and of the presence of natural herpetomonads in other vertebrates (for example, mice) are discussed. It is also recalled that insect herpetomonads can invade and live in plant tissues.

"The experiments on the introduction into different vertebrates of various species of Herpetomonas and Crithidia parasitic in insects by Laveran and Franchini, using mammals, and by Fantham and Porter, using both warm- and cold-blooded vertebrates, are summarized and discussed.

"It is inferred that the various leishmaniases are due to a herpetomonad of invertebrates which, under different conditions of environment, produces pathogenic effects in very varying degrees in different vertebrates, from zero, as in the mice described by Dutton and Todd in 1903, to high mortality as in Indian kala-azar, and probably zero again in cold-blooded hosts. It is also a flagellate which can probably live in invertebrates not already recorded as being infected. A human reservoir of leishmaniasis may occur in some places, while warm- and cold-blooded vertebrates may also function as the same.

"It is highly probable that the so-called cultural herpetomonad stages of trypanosomes were really cultures of scanty herpetomonad infections coexisting with trypanosome infections.

"It is recalled that Rogers, in 1905, published that 'it is worth while to discuss which are the most probable kinds [of insect transmitters of kala-azar] in order that precautions may be taken against them without waiting for absolute proof to be obtained.' Although these remarks were published ten years ago, little has been done directly in the way of the preventive measures suggested. A notable exception, however, is the work of Dodds-Price in Assam."

NOTES ON A CASE OF FEVER DUE TO *BACTERIUM COLUMBENSE* (CASTELLANI 1905).

By Dr. Eric C. Spaar.
Ceylon Medical Service.

A Singhalese woman, aged 30, was admitted to the General Hospital, Colombo, on August 19, 1914, with a history of fever of seven days' duration, and a temperature, on admission, of 101·4° F. Râles of various kinds were audible over both lungs, but there were no signs of consolidation, and her other organs were healthy: the spleen was not enlarged. Her temperature rose in the evening to 103·2° F., and continued to be high till the morning of the 22nd, when a marked remission was noticed, the thermometer registering 101·8° F. Thereafter the temperature gradually fell and she was free from fever on the 30th, that is, on the eighteenth day of illness. Her blood was examined for Widal's reaction on the 26th, but was found to be negative to *Bacillus typhosus*, *paratyphosus* A and B. There was marked agglutination for the *B. columbense* (over 1 in 80). The blood examined again two days later gave the same reactions and was negative for malaria. I made then a bacteriological examination of the stools and this was done from a specimen which was kindly procured for me, and had been collected in a large sterile Petri dish. The stool was plated on MacConkey's lactose red agar; numerous red colonies and some white ones developed; several of the whitish colonies which developed were further investigated and a bacterium was isolated, the cultural reactions of which were identical with those of the *B. columbense* kept in stock in the Institute in every particular. It was well agglutinated by the patient's blood. As this bacterium is not yet well known, it may be of

advantage to give here a short description of it, which I quote almost verbatim from Dr. Castellani's previous papers, as my strain corresponds in everything to his description.

Characters of Bacterium columbense.

Rods 2 to 5 microns in length, closely resembling the typhoid and paratyphoid bacilli; motile. It is easily stained by the ordinary aniline dyes, but not by Gram.

Cultural Characters.

Broth.—Abundant growth with diffuse turbidity; after twenty-four to forty-eight hours a delicate pellicle may be present.

Agar.—The growth may be typhoid-like, but often the germ grows somewhat more luxuriantly than is the case with typhoid.

Gelatine.—Growth fairly abundant, medium not liquefied.

Serum.—Nothing characteristic; the medium is not liquefied.

Litmus Milk.—It may be said that in general it becomes acid at first, and alkaline later, and that bleaching of the medium is of very frequent occurrence, but occasionally it is rendered permanently acid.

Sugar Broths and Action on Lactose.—The sugar reactions are collected in the annexed table. Some remarks may be made on the action of the germ on lactose; when freshly isolated from the stools or urine it has generally no action on lactose, but after several transplantations it may produce a very slight amount of gas at times; at other times it does not. The usual technique with Durham tubes was adopted. The experiment has been repeated many times and all precautions have been taken to avoid mistakes as far as possible. It is notable that on MacConkey's lactose red agar the colonies are always whitish—never red.

B. columbense (1905)

Motility	+	Sorbite	AG
Litmus milk* ..	$\frac{\text{Avs}}{\text{Alk}}$D	Galactose	AG
		Lævulose	AG
Lactose	O	Inosite	O
	or	Salicin	AG
	Gvs	Amygdalin	O
Saccharose	O	Isodulcite	AG
Dulcite	AG	Erythrite	O
Mannite	AG	Glycerine	AG
Glucose	AG	Indole	+
Maltose	AG	Voges-Prosk	O
Dextrine	AsGs	Red nitrates	O
Raffinose	O	Neutral red	O
Arabinose	AG	Gram	O
Adonite	O	Gelatine	O
Inulin	O	Serum	O

Abbreviations used in the table.—A, acid; G, gas; C, clot; D, decolorized; Alk, alkaline; s, slight; A/alk, acid then alkaline; Gt, general turbidity; P, pellicle; Vs, very slight; O, negative result, viz., neither acid nor clot in milk, neither acid nor gas in sugar media, non-production of indole, non-motile or non-liquefaction of gelatine or serum as the case may be; + positive result.

* See remarks in the text.

Biological Tests.

All strains of *B. columbense* have been repeatedly tested with typhoid serum, paratyphoid serum, and paratyphoid B serum, derived from patients suffering or convalescent from such diseases, as well as from hyper-immunized animals, always with absolutely negative results. The results were negative even when using dilutions of 1 in 20. The strains have been treated also with very powerful paratyphoid A and paratyphoid B sera obtained from the Berne Institute, with the same result, viz., no agglutination whatever has been observed. The absorption tests completely confirmed the agglutination tests. There cannot be any doubt therefore that the organism is neither paratyphosus A nor paratyphosus B. The germ has been tested also with various coli and coli-like sera, always with negative results.

Botanical Position of the Bacterium.

This bacterium is difficult to classify owing to its inconstant action on lactose. As already stated, though all precautions to avoid a mistake were taken, the conclusion arrived at is that the same strain, while at times a non-lactose fermenter, at other times gives rise to very slight production of gas, though the colonies on MacConkey's red agar are always white. When it does not ferment lactose its reactions are practically identical with those of *B. paratyphosus* B; when it ferments lactose it is more closely related to *B. coli*. Agglutination and absorption tests clearly show that the germ is a separate species, as it is never agglutinated by paratyphoid A and B sera, even powerful ones, such as those imported from the Berne Institute, nor by any coli and coli-like serum tested. Nor can it be identified with *B. paratyphosus* C, of Uhlenhuth, as the latter is culturally identical with the *B. suipestifer*, and in man at least is apparently non-pathogenic. It cannot, of course, be excluded that *B. columbense* may be identical with one of the so-called paratyphosus D, paracolon bacilli, &c., isolated by certain authors, as we have not in our hands at the Colombo Bacteriological Institute the whole series of such germs to enable us to carry out comparative researches: even if such were the case, however, according to the rules of nomenclature, the term *Bacterium columbense* (Castellani 1905) would have to stand owing to priority of description and name.

Résumé and Conclusion.

I would conclude by remarking that in a Singhalese woman suffering from fever, which lasted about three weeks, the blood was found to give a negative agglutination result for *B. typhosus*, *B. paratyphosus* B, and *B. paratyphosus* A; while it gave a strong agglutination for *Bacterium columbense*. From the stools a bacterium was isolated, culturally and biologically identical with *B. columbense* Castellani 1905. This leaves no doubt in my mind that the case was one of "febris columbensis."

My thanks are due to Dr. Mack for permission to use the clinical notes of the case.

THE WELLCOME BUREAU OF SCIENTIFIC RESEARCH.

The Wellcome Bureau of Scientific Research was founded towards the close of 1913 by Mr. Henry S. Wellcome, who was responsible for the equipment of the Tropical Research Laboratories bearing his name in the Sudan, for the publication of their reports, and for many contributions towards the furtherance of research in tropical medicine both in this country and abroad. The new Bureau embraces many lines of research work, but here it is only necessary to consider two of these, which are represented respectively by the Department of Tropical Medicine and Hygiene and the Historical Medical Museum. The former has its headquarters at 10, Henrietta Street, Cavendish Square, London, W., where, in commodious, central and readily accessible premises, are situated the offices, laboratories and museums, which it is hoped will serve to advance the cause of medicine and hygiene in the Tropics. The following is a brief account of the methods by which it is hoped to do so: (1) The establishment of a central bureau for the purpose of rapidly supplying information to medical men, sanitary administrators, and others interested in tropical medicine and hygiene who are resident abroad. (2) The establishment of laboratories where specimens sent from the Tropics can be examined and reported upon rapidly and accurately free of charge. In addition to ordinary clinical and pathological laboratories, there will be entomological and chemical sections. The latter will be concerned with the detailed examination of the urine and fæces from cases of tropical disease occurring in this country—a branch of research which has been rather neglected in the past—and also with investigations into the food values of tropical grains, fruits, and other foodstuffs. (3) The formation of two museums, one illustrating tropical medicine, the other tropical hygiene. They will be made as informative as possible, and in the Museum of Tropical Hygiene it is expected that actual specimens of equipment used in sanitary work in the Tropics will be shown, together with models, diagrams, &c. It is intended that the museum of tropical medicine will eventually become a graphic exposition of every form of tropical disease, arranged along definite lines, so that a complete picture of each disease will be presented in the form of maps, diagrams, photographs, models, pathological specimens, drugs used in its treatment, therapeutical technique, and indeed everything in any way relating to it. (4) The prosecution of research work in tropical pathology and medical entomology, so far as this can be carried out in England, and the establishment of a system of organized research in tropical countries. It will be seen that the programme is a large and ambitious one, for the work will eventually be world-wide. It will take much time and labour before the scheme can be fully developed, but it is hoped that its value will be generally recognized, and that help will be forthcoming from those who have it in their power to send information to the Bureau, specimens to the laboratories, and exhibits to the special museums. In all cases due acknowledgment will be made of such assistance as may be rendered, and arrangements are in force for facilitating the work of helpers and collectors, so that those who are kind enough to collaborate may be put to as little trouble as possible. It should be noted that the work of the Bureau is not intended to clash in any way with that of the Tropical Diseases Bureau, the Imperial Bureau of Entomology, or the two great Schools of Tropical Medicine. It is desired to supplement the labours of these institutions in a practical manner, to aid them wherever possible, and to cooperate with them whenever desirable. No teaching in the ordinary sense of the word will be carried on at the Wellcome Bureau, although from time to time microscopical and other demonstrations may be given. In this connection opportunities will be afforded medical men from abroad who may be visiting London and who have contributed to the Bureau to give demonstrations on the material they have sent, if they so desire. Part of the Historical Medical Museum is devoted to the study of primitive medicine, surgery, and the allied arts amongst semi-civilized and savage people, and is thus of interest to medical men abroad, while they will find that the early history of tropical diseases has by no means been neglected. They are asked to remember the existence of these useful sections of this Museum at 54a, Wigmore Street, and any help they can render in the way of furnishing information and presenting exhibits will be gratefully received and duly acknowledged.

DRUGS FROM BRITISH SOURCES.

By far the most valuable source of atropine is Egyptian hyoscyamus, or henbane. This plant grows wild in the Egyptian desert and in the Sudan, and these countries are the sole source of the commercial supply. Large quantities of the plant are freely available and a considerable amount is now, through the initiative of the Imperial Institute, in the United Kingdom awaiting manufacture into atropine.

Eserine is a product of the Calabar bean of West Africa, and presumably it is the extreme present pressure on the manufacturing resources of British drug manufacturers, rather than any scarcity of this British raw material, that is hindering the production of the drug.

As to cod-liver oil, the present high price—five times more than that of last winter—is due to Germany's demand for the Norwegian supplies. But the increased demand will be to the ultimate benefit of the oldest British colony—Newfoundland—which has been for some years manufacturing, under the Norwegian process, the highest class of medicinal cod-liver oil. Supplies of this oil are now available in the home market.

Pithecolobium dulce is the camanchile tree met with in the Philippines, the bark of which furnishes a large percentage of tannin.

Notices.

BUSINESS AND GENERAL.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 15, 1915.

THE UNREPRESENTED SECTION OF THE BRITISH FOLK IN OUR IMPERIAL AND MEDICAL COUNCILS.

ALTHOUGH in medical circles provision is made that overseas nations and the several Crown Colonies shall be represented on the Council of the British Medical Association in London, the rule is more honoured in the breach than the observance. It may be said also that, in the Crown Colonies, there is no machinery or avenue whereby the political beliefs and opinions of dwellers in these Colonies can in any way influence the destinies of the Empire.

The moment a man takes up residence in a Crown Colony he becomes disfranchised, his vote as a freeman is annulled, and he reverts to a period in which representative government was unknown. The Dark Ages of political life obtain, and a bureaucracy determines the rules and regulations under which he lives.

It is true there is a Legislative Council in most Crown Colonies, but in all of these the official members outnumber the civil representatives, and in many instances—in fact, on most occasions when any matters of economic or local importance to the community crop up—it will be found the whole of the official members vote one way, and the whole of the representatives of the community the other. The officials are told by the Governor how to vote, so that the expression of opinion is that of one man; the official vote being merely used to annul the wishes of the community.

This is at once a peculiar and rather degrading position for British folk to find themselves in, and it may take some time to rectify.

When this War is over there can be no doubt that the Dominions and Commonwealths in the Empire will demand a definite position in the counsels of the Empire, and it would seem an appropriate time to consider whether the large and important group of men who are carrying on important commercial undertakings for the benefit of Imperial needs in Crown Colonies should not also find a means of recording their beliefs.

Take China, for instance, where many thousands of Englishmen find their vocation; it would seem important that they should be represented in the Imperial Parliament, for to them we must look for guidance as regards policy and financial advice. Surely it is a greater Imperial need that men, handling the gigantic commercial and economic relations of the Empire with China and the Chinese, should have a voice in shaping the policy to be pursued, than that some unimportant borough in a sleepy English county should be given a member whose notions of Empire are limited, and whose constituents have but little idea of things beyond the local questions of drains and water supply. Distances in the modern world have shrunk. The results of polling in the Far East can be as readily telegraphed as that from the Shetlands, and is of infinitely greater importance.

In medical circles the representation of the great central Association, with its headquarters in London, is mostly on paper. Many of the Overseas Branches have no representative on the Council of the Association. The Australian Branches, for instance, were represented for a long time—and may be even now—by one man who happened to have dwelt in Australia for some time, but had long left there. He stood for Victoria, New South Wales, South and West Australia—a continent, in fact, with but one representative. His vote was but as a drop in the ocean of home votes, and therefore had little or no weight. With other overseas communities the same tale is told. When one looks into matters it will be found that were all

the Overseas Branches represented by a member, their votes would amount to a third or more of the whole Council. This, however, to some of those in power in the counsels of the Association is a state of things which is not regarded with favour, and in certain cases with some alarm. The contention of these, who resent the intrusion of men outside the home contingent in the central Council, is in the same category with those who rule the general Imperial affairs of the Empire; they declare that the home voters will be swamped, that their influence will be lessened.

It takes a long time for a parent to understand that his children have grown up and are entitled to voice their rights; and it takes a long time for the Old Country to grasp the fact that the Colonies are no longer embryo states, but full-grown Dominions and Commonwealths, the population of which in time may outnumber the people of the Homeland, and by that fact be in a position to determine the policy of the Empire.

The British Medical Association has led the way towards Imperial fusion and co-ordination. On paper this is most satisfactory, but as regards the practical working it is disappointing. The separate Overseas and Crown Colony Branches are not represented individually, but in many instances one man with but one vote represents several. The way to rectify this situation is either to regard the man representing several Branches as a delegate empowered with a number of votes equal to the Branches he represents, or to elect a member for each Branch, who shall have a seat on the Council. The first method has the objection that neighbouring Branches may have totally opposite views of policy, yet their representative, by his vote, can annul views opposed to his own, being in favour of one set of supporters and against another: a totally unfair and impossible situation.

The other method is to elect a representative for each Branch. This is met with the objection that an insufficient number of men, who know a particular community, cannot be found at home to fill the vacancies. This objection is not valid, however, there can be no difficulty in a branch, however isolated and distant, choosing any member of the medical profession willing and ready to act for the Branch, who, being made acquainted with the wishes and wants of the Branch, can speak and vote in accordance with their directions. On more than one occasion this has been done, but the home authorities declared that the individual selected was not wholly acceptable to them, and stifled the plan, wherever and whenever it could be done, on the plea that a representative who has not lived in the country of the Branch he sits for cannot be held to represent the ideas and wishes of the members of that Branch. Were this applied to Members of Parliament in this country, it would no doubt be a good thing—the ideal procedure—but it is not the case. The "carpet-bag" candidate for Parliament would be unheard-of; but, unfortunately, he is very much to the fore. A London lawyer may represent a Lincolnshire agricultural community—a man who knows, perhaps, that turnips do not grow on trees, but who has few other qualifications to justify his being elected their member.

But medical matters are medical matters in whatever part of the Empire they obtain, and a medical man at home can understand perfectly the points of view of his *confrères*, however distant, and is well qualified to bring them forward and speak for them.

It is to be hoped, for the sake of the welfare of the British Medical Association itself, that this way of regarding the Overseas Branches will be dropped. Professedly, of course, this is done, but practically it is not so. Silvery-tongued orators do not blind the Overseas men that they are, as councillors, not welcomed in too great numbers. A certain harmless number is all very well and tolerable, but it will take another generation or two for our home-dwelling section of the Empire to understand that our Colonies are no longer merely colonies, and that the people who dwell therein are not "colonials" in the sense that that term has been heretofore understood. The British Medical Association is in advance of the Government in their theoretical blending of Imperial representation; let them go further and see that each individual Branch has a representative on their Council. The Association will be strengthened; the importation of fresh ideas and ideals will advance and not hinder medicine in either its ethics or its importance to the Empire.

Annotations.

Bacteriology of Leprosy.—Johnston, in the *Philippine Journal of Science*, Section B, Tropical Medicine, vol. ix, No. 3, referring to the fact that branched hyphæ-like filaments are frequently found in cultures of the tubercle bacillus, holds that Hansen's leprosy bacillus, like the tubercle bacillus, is merely a stage in the development of a streptothrix. Johnston succeeded in cultivating non-acid-fast streptothrices from the spleens of two lepers, but in the course of experiments with cultures he found that the filaments broke up into coccoid or rod forms, which, although at first not acid-fast, became in the course of several months slightly acid-fast and later the scattered clumps became distinctly acid-fast.

Johnston holds that the *Bacillus lepræ* is merely the acid-fast stage of a pleomorphic streptothrix. These observations, in view of the close resemblance of the tubercle and leprosy bacilli, are interesting.

Lack of Protection after Anti-typhoid Vaccination.—Dr. Henry J. Nichols said, at the meeting of Military Surgeons of the United States (*New York Med. Journ.*, November 20), that the Widal test was not trustworthy, because, after vaccination, not only might positive reaction persist for a year or more, but also a latent

Widal reaction might actually be made positive by other infections. The recovery of typhoid bacillus from the blood, urine, or fæces, or an autopsy with a demonstration of anatomical lesions, was practically the only sure way of specific diagnosis of typhoid fever after vaccination. In the case of the English Army in India, when two doses were used, immunity began to disappear within two and a half years. At present one revaccination with three doses four years after the first vaccination seemed sufficient. The question of the best strain of bacillus was still under discussion, but Rawling's strain as used in the Army seemed most effective. Vaccination was most effective the first three months after its manufacture, and after eight to twelve months became inert. A sensitized vaccine made less of a demand for reaction and hence produced less immunity. The reason that vaccination was more successful in the Army than in civil life was probably the use of a better vaccine, although modern sanitation might have some slight influence.

Points in the Prevention of Asiatic Cholera.—Dr. Allen J. McLaughlin, Surgeon, U.S.P.H.S., said, at the meeting of Military Surgeons of the United States (*New York Med. Journ.*, November 20), that with a thorough knowledge of the carrier and the bacteriological technique, the prevention of cholera became easy. In Germany, in 1905, and in Manila, in 1908, examination of healthy persons showed about 7 per cent. to be bacillus carriers. In the Bilibid prison an outbreak occurred almost annually. Upon examining 264 inmates, seventeen were found to be carriers, or about 6·44 per cent. This was quickly suppressed by compelling thorough disinfection of the hands under guard, upon leaving the latrines and before eating. He had personally never known a bacillus carrier to harbour cholera vibrios for longer than twenty days, and generally not over ten days. He gave a table of observers who had noticed duration from ten to sixty-nine days. One person in Germany had vibrios for six months, and this suggested infection of the gall-bladder and biliary passages—especially since the appearance was intermittent. In this particular case a saline purgative brought them out after a three weeks' negative reaction. Autopsy had found infection in biliary passages, so it seemed as though there existed long time carriers in cholera as well as in typhoid. A five-day quarantine was not rigid enough for such persons unless a bacteriological examination was made of their stools. Under this system 150 stools could be examined very thoroughly in a day. Frank cases of cholera were less of a menace in spreading the disease than the carrier. Atypical cases often existed unsuspected in children. Diagnostic procedures might be limited to securing from the fæces a pure culture of vibrio and its agglutination by an anti-cholera serum of at least 1 to 4,000 titre. Enriching fluid should always be used, as vibrios were scarce in carriers. They should avoid the use of gelatine and use agar plates, 3 per cent., neutral to phenolphthalein. The so-called cholera red reaction was valueless. Hanging drop procedures were time consuming and of little value because they were indefinite. He had never found freshly isolated cholera vibrios affected, even in dilutions of 1 to 10, by any except anti-cholera serum, in which they gave instantaneous agglutination of 1 to 200 and 1 to 1,000, or in one hour with dilutions at least 1 to 4,000. He never found a cholera vibrio freshly isolated from the human body which showed hæmolytic properties or any marked variation in morphology; but practically, in strains freshly isolated, were found normal orthodox cholera vibrios which would respond to agglutination tests in a normal and orthodox manner. In addition to ordinary laboratory equipment only the following were needed: Cholera material, agar plates, peptone solution, anti-cholera agglutinating serum of a titre not less than 1 to 4,000. Cholera material was planted in peptone solution and placed direct on agar plates which were streaked from the solution after three, six, or twelve hours. The vibrio colony was tested in drops of 1 to 200 cholera serum on a glass slide for quick diagnosis, to be confirmed by a quantitative agglutination to the limit of agglutinability later. For the quarantine officer all cumbrous methods and unnecessary corroborative technique must be eliminated. For saving of time, test tubes were used instead of large flasks for peptone solution. Goldberger media increased the vibrios, but did not cause them to be overgrown, and this medium would be a greater restriction on the passage of Asiatic cholera through quarantine.

Fibroleioma of the Bladder (Gustaf Grönberger, *Nordiskt Medicinskt Arkiv*, September 29, 1915).—The patient, a woman of 44 years, eight years ago had sudden hæmaturia without other symptoms, but later increased frequency of micturition occurred on walking and standing. This gradually grew worse, and four years later was complicated by ardor urinæ and turbid urine. On entering the hospital, the patient's condition had become unbearable, and the voiding of urine was so difficult that only in certain postures could it be accomplished. Examination revealed a swelling over the symphysis pubis, and palpation showed this to be separate from the fundus uteri. The cystoscope revealed a tumour in the anterior bladder wall the size of a hen's egg. Suprapubic cystotomy was undertaken and the tumour extirpated with the aid of a cystoscope introduced through the incision. Recovery was uneventful, the patient leaving the hospital in two months. The fibroleioma had a short, thick pedicle and showed ulceration of the apex. These tumours are in structure similar to uterine myomata, and like these may undergo degeneration. In the reported cases, thirty-one tumours were benign, the other six being malignant, atypical leiomata. In six, hæmaturia was the initial symptom. They vary in size from a small nut to a child's head; one of this latter size was mistaken for a uterine tumour, with operation and death. Their occurrence in men and women is equally frequent, and the ages of the patients were from 12 to 63 years.

Abstract.

STUDIES OF PELLAGRA.[1]

THE zeist theory of the origin of pellagra is not yet entirely abandoned, and some students of the subject are still endeavouring to connect the incidence of pellagra with some factor related to maize, or Indian corn, in the diet. At the present moment, however, a greater interest centres in the broader hypothesis that pellagra is due to some communicable factor and should be placed in the category related to that of infectious disease. The Thompson-McFadden Pellagra Commission[2] has stated that its efforts to discover the essential pellagra-producing food or the essential pellagra-preventing food have not been crowned with success. Their evidence suggests that neither substance exists in the population studied by them. Hence they have been inclined to postulate a communicable agency in the etiology of pellagra.

Goldberger, of the United States Public Health Service, and his associates have announced the experimental causation of pellagra in a group of human beings, as well as the cure and prevention of the disease among three groups of persons widely separated from each other geographically.[3] As a result of epidemiologic studies, Goldberger had concluded in effect that pellagra is not a communicable disease, that it is dependent on some as yet undetermined fault in a diet in which the animal or leguminous vegetable component is disproportionately large, and that no pellagra develops in those who consume a mixed, well-balanced and varied diet. Having already observed the benefits of dietary treatment, Goldberger began a series of feeding experiments to confirm their epidemiologic findings.

The first series of these to cure and prevent pellagra were undertaken at two orphanages in southern Mississippi. During the spring and summer and up to September 15, 1914, there had occurred at one of these institutions seventy-nine cases of the disease among a total population of about 200 inmates and employees, and at the other 130 cases among a total of about 220 inmates and employees. September 15, the diet at both institutions was supplemented by a very decided increase in the proportion of the fresh animal and leguminous protein foods. This increased diet has been continued to date, a period of about fourteen months. Of these cases, sixty-seven in the first institution and 105 in the second institution were continued under observation by the investigators for more than one year, and in only one case was there evidence of the recurrence of the disease, following the change in diet mentioned. Among the residents of these orphanages who had not had pellagra in 1914, a total of ninety-nine and sixty-nine respectively, none developed the disease subsequently. In other words, in these two institutions, with a total population of approximately 420, almost 50 per cent. of whom had pellagra in 1914, the disease entirely disappeared following the use of the supplemented diet, and in only one case has there been a recurrence.

In the second experiment, undertaken in December, 1914, in the Georgia State Sanitarium, about forty white and forty coloured insane adults who had had pellagra in 1914 were placed in separate wards, and the diet supplemented, and special care taken in supervising the feeding. At the beginning many of these patients presented "marked residuals" of their attacks. Of the pellagrins mentioned, seventy-two have remained under observation to date. Of the thirty-six coloured patients, eight had given histories of at least two annual attacks, and of the thirty-six white patients, ten had given histories of at least two annual attacks. None of the seventy-two patients has had recurrence this year. During the same period, not less than fifteen of thirty-two control female pellagrins developed recurrences. In all the institutions, except for diet, the hygienic and sanitary conditions were unchanged. From these experiments it is evident that pellagra has not only been cured but also prevented by means of appropriate diet.

In order to test further the relation of diet to pellagra, however, Goldberger undertook to produce the disease among convicts who had volunteered for this experiment on promise of a pardon. The experiment was carried on at an isolated convict camp at which, besides the twelve volunteers, there were about seventy controls, twenty of whom were kept under special medical surveillance throughout the period of the experiment, that is, from February 4 to October 31, 1915. There had been no history of pellagra at this camp. These volunteers were strictly segregated and kept under guard night and day. From February 14 to April 19 no change of diet was made, and on careful routine examination no evidences of pellagra were detected. On the latter date the diet was changed, the quantities of the different articles of food comprising it having a caloric value of 2,952 calories per man per day. No vegetable fats entered into the diet. The corn meal and grits were of the best quality obtainable in the local market and the same as used at one of the orphanages ("M. J."), Jackson, Miss., at which a feeding experiment to prevent pellagra was conducted and at which no pellagra occurred this year.

The general sanitary environment of the volunteers and controls was the same, but the personal cleanliness and freedom from insects and vermin were in favour of the volunteers. Of eleven volunteers who completed the experiment (one was released because of prostatitis), six developed symptoms, including a "typical" dermatitis, justifying a diagnosis of pellagra. The nervous and gastro-intestinal symptoms were mild, but distinct. In

[1] Abstracted from *Journ. Amer. Med. Assoc.*, November 20, 1915.

[2] Siler, J. F., Garrison, P. E., and McNeal, W. J.: "Further Studies of the Thompson-McFadden Pellagra Commission," Second Progress Report.

[3] Goldberger: "Prevention of Pellagra," Public Health Report, October 22, 1915; *ibid.*, November 12, 1915, p. 3386.

all six the skin manifestations were first detected on the scrotum, in two subsequently on the backs of the hands, and one on the back of the neck.

These positive experiments demonstrate that pellagra is a nutritional disease, but they do not single out any particular article of food. From these studies and observations in other places it is unlikely that any single article of food will be incriminated, for the "grits" which entered into the diet of the convicts who developed pellagra also entered into the diet of the children of one of the orphanages who entirely escaped the disease. Moreover, in Nairobi, where 119 cases have been reported, no maize had been raised, and "none had ever been brought into the country."

A statistician of the Public Health Service[1] has suggested a possible relation of the incidence of pellagra to certain conditions of an economic character. His industrial investigations show that the lower the economic status of the white American family, the greater is the pressure for sacrifices in diet, particularly in animal protein foods, since these are the most expensive. The economic status of wage-earners' families in the Southern States, particularly of cotton mill families, is lower than that of wage-earners' families in other sections of the country. Certain factors have tended to restrict the supply of protein foods in southern industrial localities that do not restrict, at least to the same extent, the supply of carbohydrates and fat. Budgetary studies of a large number of native white wage-earners' families, generally comparable as to family income and size, indicate that the proportion of proteins in the diet of southern families is considerably less, and of carbohydrates and fat considerably greater than in the diet of northern families. Certain factors have tended to intensify this condition in recent years, particularly since the industrial depression began in the latter part of 1907. While the supply of a better-balanced diet in southern industrial localities has apparently not been improved materially, the economic status of wage-earners' families, especially in the cotton goods and lumber industries, has been lowered, and retail prices of foods have greatly increased, this increase being more pronounced, particularly since 1907, than in other sections of the country. The increase in retail food prices has been at least 40 per cent. higher for proteins than for carbohydrates or fat. The available data thus point to a lessened financial ability of southern wage-earners' families to provide a properly balanced diet, as well as a decrease in the availability (measured by retail prices) of an animal protein food supply for the wage-working population, particularly since about 1907 or 1908. Incidentally they tend to support the view that pellagra may be a deficiency disease, as are beriberi and scurvy, which have so often been discussed in relation to it.

It remains, therefore, to determine by further dietary and laboratory studies, which will of necessity be of a highly technical nature, the deficient or disproportionate elements in diet responsible for this disease. Judging by the advancements recently made, the problem will be eventually solved. In the meantime, there is available a practical means of prevention and cure, and to Goldberger and his associates great credit is due for their work. In view of the increasing prevalence of pellagra, and the fact that over 7,500 people in the United States will die of the disease during the present calendar year, the value of their studies from both public health and economic standpoints may be compared to those of the discovery of the relation of diet to beriberi, or the mosquito to the transmission of yellow fever.

[1] **Sydenstricker, Edgar: "The Prevalence of Pellagra: its Possible Relation to the Rise in the Cost of Food," Public Health Report, October 22, 1915.**

Drugs and Appliances.

Cystazol, a combination of hexamethylenetetramine with sodium benzoate, prepared by Allen and Hanburys, Ltd., London, is recommended as a urinary antiseptic. The liberation of formaldehyde and benzoic acid in the urine is calculated to deal with *Bacillus coli* affections and bacilluria generally.

Sanaphos.—The British Milk Products Co., Ltd., 69-70, Mark Lane, London, E.C., which has done so much to uphold milk products in Britain, has added to its well-known articles of diet a preparation termed "Sanaphos." The well-advertised "Sanatogen" which has so long held the market has met with a serious competitor, and to anyone who has tried Sanaphos its supremacy over its German rival will be at once recognized as established.

To tropical residents the fact that Sanaphos has been used in the Mesopotamian expedition with completely satisfactory results will be welcome news, and we heartily recommend Sanaphos for use in warm climates.

Yellow Oxide of Mercury Ointment.—Messrs. Parke, Davis and Co. have prepared a 1 per cent. ointment of yellow oxide of mercury in collapsible tubes containing one drachm of the ointment. These are sold in packets of twelve in each. These have been useful in war and in tropical work where sun and dust plague the eyes and induce conjunctival troubles.

THE search for new textile raw materials in Germany continues. The hop-bine, the willow weed, nettle fibre, broom, &c., have proved useless. As a substitute for the usual surgical lint, which is made of absorbent cotton waste, a substance termed "lignin" is being exploited. Lignin is cellulose prepared from wood. A cellulose wadding made in sheets resembling cotton waste is being made in Sweden.

Colonial Medical Reports.—No. 45.—Federated Malay States (*continued.*)

In Selangor 11,976 of the total unverified are Tamil coolies vaccinated on arrival at Port Swettenham and then drafted to various estates, and about whom no statistics are available. Only Saigon lymph was used and which continued to give satisfaction; 33,827 vaccinations were performed by Government vaccinators and 13,067 by the medical staff of various estates with lymph supplied free of charge by Government. In Pahang the vaccination performed in the Coast districts of Pekan and Kuantan—viz., 1,239 cases—would have been much greater if the vaccinator's boat had not been swamped on returning from the coast mukims last September whereby the vaccinator lost all his property including the returns of vaccination he had just carried out

METEOROLOGY.

Perak.

The highest temperature, 96° F., was recorded at Taiping and Batu Gajah in July and August, respectively, and the lowest, 62° F., at Tapah.

The rainfall was as follows :—

Taiping	147·09 in.
Kampar	136·57 ,,

Selangor.

The highest temperature was 101° F.; the lowest 62° F.

The following rainfall was recorded:—

Kuala Kubu	111·26 in.
Kuala Lumpur	108·18 ,,

Negri Sembilan.

The highest temperature was 97° F.; the lowest 65° F.

The rainfall was as under :—

Port Dickson	96·50 in.
Mantin	88·90 ,,

Pahang.

The highest temperature was 99° F.; the lowest 63° F.

The following rainfall was registered :—

Sungei Lembing	153·14 in.
Pekan	123·17 ,,

The year under review will be memorable for its flood which occurred in December, causing a good deal of damage and distress, especially in Pahang. In Kuala Lumpur the ground floor of the public offices were inundated to the level of 2 ft. or 3 ft., while the business houses in the neighbourhood of the Government buildings were submerged for about 5 ft. or 6 ft. with consequent damage of goods valued at a considerable sum.

ESTATES.

The number of estates, including rubber, coco-nut and other cultivations, registered on December 31, 1910, was 501, the approximate area being 701,786 acres, with a labour force of 143,614.

The number of labourers given does not include the coolies, who work by contract and do not live on the estates. The number is small, consisting chiefly of Chinese women employed in weeding. The majority of the labourers on the estates is composed chiefly of Tamils and other natives of Southern India. Chinese, Javanese and Malays are also employed in large numbers, with a few Japanese in Perak.

There has been a considerable addition to the number of estate hospitals and general arrangements for the care of sick coolies, but it is reported that there is great difficulty in obtaining medical men and dressers. If dressers are to be attracted to take up positions on estates, the arrangements made for their comfort, hours of rest, and recreation, &c., must be such as will satisfy reasonable demand. I have received many letters from dressers asking for work at very much less pay than is being given on estates, because the conditions of living are so uncomfortable, and the duties so arduous, that they are ready to sacrifice income rather than remain in their situations. The health officers report that many sanitary improvements have been carried out on estates, but much remains to be done in all parts of the country.

IMMIGRATION.

Considerable increase of Indian immigration is recorded for 1911. This is satisfactory, but the influx of such a large number of aliens means much responsibility and work for Government officials. These people come here to earn money, and they would not leave their homes if they were prosperous, and it is, therefore, probable, that before departure their physical condition is not up to standard, and this renders them an easy prey to any disease with which they are brought into contact; more than that, a considerable number are recruited from up-country districts in India where small-pox, cholera and plague are frequent occurrences. Consequently it was decided to keep all coolies under observation for seven days before allowing them to depart for the various places where they were engaged to work; during this seven days, vaccination and disinfection was carried out, and those found suffering from illness or those who developed illness kept back. From January to August all coolies were sent to Pulau Jerejak, but at one time overcrowding took place, and as the camp could hold no fresh arrivals it became a question whether immigration should be temporarily stopped—this would have caused a very considerable loss to all planters and others, and the only way to arrange the difficulty and continue receiving weekly ship-loads of coolies was to provide accommodation elsewhere. The Chief Secretary called a meeting of planters and secured their co-operation — material was promised by them and hurriedly forwarded to Port Swettenham, and thanks to the energy of Mr. Swift, of the Public Works Department, a temporary camp was built, completed and occupied in fourteen days. This camp consisted of wooden sheds, with sleeping benches, kitchens, latrines and bathrooms to accommodate 3,000 coolies, and it has been in use ever since August; all coolies except those wanted in Perak have passed through it and it has proved entirely satisfactory.

It is very important that the advantage of a generous diet should be carefully considered by all employers of labour. Several years' experience with a very large,

constantly changing, labour force has been so convincing that plenty of nourishing food is one of the most important factors in maintaining good health, that I feel compelled to urge everyone who has labourers under his control to pay particular attention to the food supply of coolies. It is most essential to build up and strengthen new arrivals who have very little reserve force to call upon, either for work or to resist illness. Individuals removed from their houses and placed under new conditions are always more liable to disease, and regular work is a greater effort and means a large expenditure of energy in the early days. Work in tropical countries involves a greater expenditure of energy than labour in temperate climates—a labourer needs a definite supply of proteids, fats, carbohydrates and salts to enable him to work and provide resistance to disease—unless this is given the output is poor and mortality rates rise, so that not only from the human point of view, but also from the business aspect, it is necessary that this supply is adequate. Expenditure on prevention of illness is soon repaid with large interest, stupid ignorance or wilful neglect of this important duty means unnecessary wasteful extravagance as well as loss of life. The prison diet scale for Tamils is copied for general information. It is noted that opening up of rubber estates in unhealthy areas is attended with serious results to life and health, and it is to be hoped that a safer and less expensive method will be the practice of the future. It seems probable that the preliminary felling of jungle in hilly country, exposing streams and springs, leads to greater activity of the malarial-carrying mosquito with dire results. If only just enough preliminary clearance could be effected in order to tackle these streams and springs and put them underground within the residential areas, it might mean that the labour force would remain healthy whilst the estate is felled, burnt off, cleared and planted. In flat lands ordinary drainage could take the place of an underground system.

REPORT ON THE INSTITUTE FOR MEDICAL RESEARCH.

Beriberi.

In the Annual Report for 1910 an account was given of the researches which had been carried out with a view to the isolation and determination of the substance of high physiological importance contained in "polishings."

It was shown that this substance was soluble in slightly acidulated alcohol, that the percentage of it contained in "polishings" was extremely small, that exposure to the temperature and for the time required in the ordinary process of rice-cooking did not destroy the active substance, but that exposure to steam under pressure did destroy it.

Further work on this subject has been done during the past year.

Reverting to the practical aspect of this subject, that of the prevention of beriberi, it is satisfactory to find that the conclusions arrived at have received confirmation by investigators in most of the countries where this disease occurs. The accuracy of the chemical part of the work has been confirmed by the researches carried out in the Bureau of Science, Manila; the Lister Institute of Preventive Medicine; and the Laboratory of Bio-Chemistry, University of Liverpool.

It may therefore now be considered as beyond dispute :—

(1) That among peoples whose staple of diet is rice, beriberi is caused by the continuous consumption of polished rice and may be prevented by the substitution of unpolished rice.

(2) That a harmless rice becomes a harmful one when cooked by steam under pressure.

It is not anticipated that the application and adaptation of these facts to actual conditions will be rapidly accomplished. Adventitious factors which have been gradually excluded in the course of research will in practice have to be reincluded.

Malaria.

During the past year malaria was prevalent to an unusual extent throughout the Federated Malay States, and as preventive measures against a disease, if they are to be effective and economical, must be guided by accurate knowledge of the factors concerned in its spread, special attention has been devoted to anopheline mosquitoes, the distribution of species and their relative efficiency as malaria carriers. Other circumstances affecting the incidence of the disease have also been investigated.

Dr. Stanton has carried out the investigations on this subject and reports as follows :—

From an examination of the characters of adult anophelines it was apparent that several Malayan species, here referred to under new names, were identical with species already known under different names in other countries. One practical result of this chaotic state of nomenclature is that the knowledge gained of malaria in one country is rendered more difficult of application to the circumstances of the other. It is important to secure uniformity in regard to this point among workers in countries similarly circumstanced, and thanks to the courtesy of Major James, I.M.S., and officers of the Central Malaria Bureau of India, there is a prospect that this may be accomplished for the countries comprised in the Oriental region. A large series of specimens of Malayan species of anophelines have been compared with types of Indian species and a paper embodying the results of the observations made was read at the recent meeting of the Far Eastern Association of Tropical Medicine at Hong Kong.

It is proposed further to compare Malayan species with types in the British Museum and elsewhere, and in this way to eliminate the doubt that now obtains as to the names by which certain anopheline mosquitoes should be known. When these observations are completed it is intended to publish the results in a form which will make them readily available to medical and sanitary officers.

Anopheline larvæ were studied by examining specimens taken in nature and also specimens hatched out from eggs of known species. What is believed to be a new observation was made in regard to larval characters, namely, that those characters upon which reliance has been placed in the differentiation of

LONDON SCHOOL OF TROPICAL MEDICINE.

46th Session. October—December, 1914.

Back Row.—Robert (*Lab. Assist.*), G. C. S. Perera, G. Warren (*Lab. Assist.*), E. B. Bate, F. Mahabir, I. P. Masters.
Middle Row.—W. A. Elder, C. Deuntzer, E. N. Darwent, L. S. Luton, A. E. Schokman, J. E. Moffatt, W. I. Escoffery, W. G. Heath.
Front Row.—J. G. Thomson (*Protozoologist*), H. B. Newham (*Director*), Miss H. H. Stevens, Miss H. G. Morland, Col. A. Alcock (*Medical Entomologist*), Dr. F. M. Sandwith (*Lecturer*), Miss F. Cunningham, H. M. Hanschell (*Med. Supt.*), R. P. Cockin (*Demonstrator*).
Absent.—R. Leiper (*Helminthologist*), Miss G. C. Dixon, Miss R. Jones, D. T. Birt, J. H. Fenn, H. Suhrawardy, T. Kojima.

RETURN OF DISEASES AND DEATHS IN 1911 IN THE FOLLOWING HOSPITALS: PERAK, SELANGOR, NEGRI SEMBILAN, AND PAHANG,

Federated Malay States.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	39	1	40
Anæmia	1002	121	1054
Anthrax	—	—	—
Beriberi	5340	695	6042
Bilbarziosis	—	—	—
Blackwater Fever	10	3	10
Chicken-pox	41	—	42
Cholera	46	34	46
Choleraic Diarrhœa	—	—	—
Congenital Malformation	1	—	1
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	36	1	36
Diabetes Mellitus	12	1	13
Diabetes Insipidus	1	1	1
Diphtheria	—	—	—
Dysentery	6956	2131	7225
Enteric Fever	30	13	32
Erysipelas	69	18	72
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	1072	7	1141
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	2	—	2
Kala-Azar	—	—	—
Leprosy	404	136	927
(a) Nodular	—	—	—
(b) Anæsthetic	—	—	—
(c) Mixed	—	—	—
Malarial Fever—	—	—	—
(a) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	18181	1369	18623
Quartan	924	46	957
Irregular	226	52	231
Type undiagnosed	10895	339	11092
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	1283	122	1310
Malta Fever	—	—	—
Measles	76	5	77
Mumps	43	—	44
New Growths—	—	—	—
Non-malignant	97	6	102
Malignant	139	50	148
Old Age	—	—	—
Other Diseases	1801	593	1870
Pellagra	—	—	—
Plague	5	4	5
Pyæmia	10	6	10
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	1716	25	1821
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	29	20	29
Sleeping Sickness	—	—	—
Sloughing Phagedæna	43	14	47
Smallpox	52	13	53
Syphilis	—	—	—
(a) Primary	687	1	714
(b) Secondary	2383	55	2524
(c) Tertiary	273	17	299
(d) Congenital	26	2	27
Tetanus	6	3	6
Trypanosoma Fever	—	—	—
Tubercle—	36	10	38
(a) Phthisis Pulmonalis	1720	872	1806
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
GENERAL DISEASES—*continued.*			
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	56	2	57
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	1570	121	1678
Circulatory System	—	—	—
(a) Valvular Disease of Heart	260	89	280
(b) Other Diseases	100	29	105
Digestive System—	—	—	—
(a) Diarrhœa	1548	402	1610
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	74	3	77
Congestion of Liver	—	—	—
(d) Abscess of Liver	20	8	21
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	107	26	109
(g) Cirrhosis of Liver	372	154	387
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	22	2	22
(j) Other Diseases	1966	167	2006
Ear	124	1	127
Eye	1116	13	1196
Generative System—	—	—	—
Male Organs	1743	20	1805
Female Organs	182	6	188
Lymphatic System	1462	19	1535
Mental Diseases	690	178	1011
Nervous System	786	139	950
Nose	24	—	25
Organs of Locomotion	521	33	562
Respiratory System	2248	247	2329
Skin—	—	—	—
(a) Scabies	1135	3	1175
(b) Ringworm	82	—	84
(c) Tinea Imbricata	—	—	—
(d) Favus	—	—	—
(e) Eczema	486	—	501
(f) Other Diseases	10834	143	11480
Urinary System	926	242	965
Injuries, General, Local—	—	—	—
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	107	—	30
Ascaris lumbricoides	400	6	410
Oxyuris vermicularis	—	—	—
Doohmius duodenalis, or Ankylostoma duodenale	2120	306	2225
Filaria medinensis (Guinea worm)	19	—	19
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	22	1	22
Vegetable Alkaloids	63	7	64
Nature Unknown	—	—	—
Other Poisons	56	—	58
Surgical Operations—	—	—	—
Amputations, Major	34	5	34
,, Minor	156	8	160
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

species, such as the clypeal and palmate hairs, are not constant in the one species, but that these characters vary at different stages of development. The clypeal hairs of the recently hatched larva of *Myzorhynchus sinensis*, for example, are unbranched, whereas in the adult larva of this species the external frontal hair is much branched. The fan-like palmate hair of the adult larva is represented in the recently hatched larva by a single leaflet. These observations show that in the identification of species too great reliance has hitherto been placed on larval characters and that it is not possible by the examination of the larvæ in a given area to say with certainty what species are present.

In connection with the transmission of malaria, an observation made in the course of the examination of anophelines taken in the Pudoh Gaol, Kuala Lumpur, may prove to be of importance. In about 1 per cent. of the anophelines a small midge (*Chironomid*) was observed to be attached to the abdomen of the mosquito and engaged in sucking blood from the stomach. The anophelines were of the following species: *N. fuliginosus*, *N. karwari*, *M. sinensis* and *N. rossi*, two of which are known to be carriers of malaria. In captivity the *Chironomid* remained attached for some hours and the mosquito apparently made no effort to rid itself of the invader. These observations raise an interesting question as to the part that may be played by such flies in the transmission of mosquito-borne diseases. It is by no means improbable that such midges may carry the sporozoites of malaria directly from an infected mosquito to man. This hypothesis is one worthy of further investigation.

While it is a truth that malaria is spread by the agency of anopheline mosquitoes, and while there is a high degree of probability that these insects are the most important, perhaps the only, means of propagation, it appears to have been assumed on inadequate grounds that a small number of malaria-carrying species in an area is necessarily associated with a low incidence of the disease. Certain observations made in the course of the present inquiry would appear to controvert this view. On some estates where the maximum spleen and parasite rates prevailed few anophelines of any sort were to be found, while in other areas, where malaria-carrying anophelines were numerous, these rates were low. Also it was noted that where different classes of labourers were under identical conditions so far as the mosquito factor is concerned, such as free and indentured labourers on the same estate, the parasite rates varied widely in the two groups. It is clear that factors affecting the general well-being of labourers, such as the quality of the food supply, housing, &c., are by no means negligible in the prevention of malaria, as they are equally not negligible in the prevention of other diseases. To these factors attention must be directed as well as to measures which aim at the reduction of mosquitoes if the disease is to be combated successfully in the conditions which obtain in this country.

Rabies.

Investigations on this subject were carried out by Dr. Fletcher, who reports as follows:—

Forty-two brains from cases of suspected rabies were received at the Institute. Thirty-nine of these were from dogs, one from a man, one from a cow, and one from a cat. Twenty-five of these specimens gave positive results, eleven negative, and six were inconclusive on account of the condition in which the material was received.

Negri bodies were not found in the human brain, which was that of a boy who developed rabies forty days after being bitten by a dog. Two rabbits were inoculated with portions of this brain and developed rabies. In the brains of both rabbits Negri bodies were found.

Negri bodies were found in fresh smears prepared from sixteen of the brains submitted for examination, and the findings were confirmed in stained sections.

In one case Negri bodies were not detected in the fresh smear, but they were found in stained sections and the result confirmed by animal inoculations.

Subdural inoculations of rabbits were made from four of the brains in which Negri bodies had been found in fresh smears; in each case a positive result was obtained.

Subdural inoculations of rabbits were made from seven of the brains in which the findings in fresh smears had been negative. Two of these gave positive results, one being the human case mentioned above and the other a case in which the brain was so broken and pulped that the cornu ammonis could not be found.

The brains of all inoculated rabbits were examined after death, and in all positive cases Negri bodies were found.

In these rabbits inoculated subdurally the incubation period was sixteen or seventeen days, except in one case where symptoms developed on the thirty-fifth day. The average incubation period in the case of rabbits inoculated intra-muscularly was thirty-seven and a half days, in one case it was as long as seventy days.

Cholera.

During October, twenty fatal cases of suspected cholera occurred at the District Hospital and were investigated with the object of determining the value of the examination of films made from the fæces in such cases.

Smears from three of the cases showed vibrios in almost pure culture. The *post-mortem* appearances and cultures were confirmatory.

In eleven cases the smear contained numerous vibrios, and in these cases the *post-mortem* findings and cultures were confirmatory.

In two cases the smears contained few vibrios; subsequent investigation showed that one of the two was cholera and the other not.

In five cases the examination of the smears gave negative results. In two of these cases no autopsy was made, and in the other three the appearance of the organs was not characteristic and attempts to isolate the cholera vibrio were negative.

Material from cases which occurred at the lunatic asylums, Kuala Lumpur and Taiping, was also examined.

Colonial Medical Reports.—No. 45.—Federated Malay States (*continued.*)

Cultures from the District Hospital cases, from the Kuala Lumpur Lunatic Asylum, and from the asylum at Taiping agglutinated with immune serum in dilutions of 1 in 8,000.

All the cultures reacted positively to the saturation test and none of them lysed blood corpuscles in less than seventy-two hours.

PLAGUE.

The investigations carried out on this subject by Dr. Fletcher have not been completed. He reports as follows:

The organs from a patient whose illness was suggestive of plague were received for examination at the beginning of November. No bacilli like *B. pestis* were found in smears made from the tissues, but an inoculated guinea-pig died from plague on the sixth day and from it plague bacilli were isolated.

Subsequently material from three other cases was examined with positive results. One of these was from Seremban, one from Sungei Besi, and one from Kuala Lumpur.

During the last week in November and during December, dead rats which had been picked up in Sungei Besi and Kuala Lumpur were sent by the Medical Officer of Health to the Institute; one rat from Sungei Besi and three from Kuala Lumpur were found to be plague infected. The examination of the rats of Kuala Lumpur with reference to the prevalance of plague amongst them and the kinds of fleas they carry is still in progress.

PATHOLOGY AND BACTERIOLOGY.

Thirty-one specimens of tumour-tissue were received for histological examination, of which twenty-two were found to be malignant in character.

Forty-nine specimens of blood were submitted to the Widal test for typhoid fever with positive results in eleven cases only; in several of these the agglutinating power of the serum was also tested with *Bacillus paratyphosus* A and B and also with *Micrococcus melitensis* but with negative results in all cases.

The complement-deviation test of Wassermann for syphilis was applied in nineteen cases with seven positive results.

The value of this reaction is still the subject of much discussion in scientific circles. A pure antigen has never been prepared, and it is contended that the substance which functionates as an antigen and is prepared from liver may contain antigens derived from contaminating micro-organisms, so that a slight reaction obtained by the use of this impure material may lead one to believe that the serum has been obtained from a case of lues. On the other hand, it may rightly be urged that a slight reaction is not inconsistent with an early stage of specific infection.

Skill in technique and the personal equation are important factors in this reaction, and in cases where the results obtained are doubtful, clinicians must continue to base their diagnosis on the clinical conditions rather than on the findings in a laboratory.

Twenty-five specimens of urine were submitted to biological, chemical and spectroscopic examination. The number of cases in which hæmoglobin is demonstrated in the urine has increased greatly in recent years, and this may be taken as a fair measure of the extent and severity of malarial infections.

The Klebs-Loeffler bacillus was isolated in two cases from throat swabs. This is mentioned as of interest, because diphtheria is uncommon in this country, only two or three cases being admitted to Government hospitals in a decade.

H. FRASER.
Director, Institute for Medical Research, F.M.S.

Colonial Medical Reports.—No. 46.—Saint Vincent.

MEDICAL REPORT OF SAINT VINCENT FOR THE YEAR 1910—1911.

By CYRIL H. DURRANT, M.B.

Medical Officer, Kingstown District.

THE population of the Kingstown district, which comprises the town of Kingstown and the village of Edinboro, was 4,703.

There were 157 births and 83 deaths, giving a birth-rate of 33·3 per 1,000 and a death-rate of 17·6 per 1,000. There were 10 stillbirths recorded.

Of the 157 births recorded 59 or about 37 per cent. occurred at the maternity ward of the Colonial Hospital.

As compared with the year 1909—1910, with a population estimated at 5,000, there were 162 births and 81 deaths equivalent to a birth-rate of 32·4 per 1,000 and a death-rate of 16·2 per 1,000.

Sickness was prevalent throughout the district in the two middle quarters of the year, viz., July to January, and this period assumes the higher death-rate.

During this time an epidemic of whooping-cough raged through the district, with 7 deaths from broncho-pneumonic complications. The disease had been known to be prevalent in the district in July, but no cases attended at the dispensary until August,

when 17 were treated. The epidemic in the town, which spread along well marked lines, reached its climax in September and then slowly declined, and the last case attended to was treated in February. Cases are still, however, being frequently met with in some of the inland villages in the island.

The severity of the epidemic is attributable to the fact that whooping-cough has not been met with in this island since 1902: and in the nine years that have elapsed, a considerable non-immune population has arisen and the seed having been sown on suitable soil the disease spread rapidly through the island. As a means of staying the infection all public and private schools were closed from the middle of December to the end of January, 1911.

Catarrhal fevers were prevalent during January, February, and March, 1911, but these conditions did not affect the death-rate to any material extent.

Malarial fever was much less common than is usual.

Gastro-enteritis in children, though probably to a less extent than formerly, and pulmonary tubercle still claim their share of victims.

Name of disease	Number of cases	Number of deaths
Notifiable diseases—		
Chicken-pox	4	—
Cholera	—	—
Diphtheria	—	—
Enteric fever	—	—
Leprosy	1	—
Measles	—	—
Mumps	—	—
Plague	—	—
Small-pox	—	—
Whooping cough	246	7
Yaws	73	—
Yellow fever	—	—
Other diseases—		
Ankylostomiasis	25	—
Anthrax	—	—
Catarrhal fevers	137	3
Diarrhœa, adults	10	1
,, children	51	7
Dysentery	24	1
Filaria	20	—
Malarial fevers	47	1
Malignant new growths	5	1
Pulmonary tuberculosis	31	5
Syphilis	168	7
Tetanus	1	1
Ulcers (except syphilis and yaws)	70	—
Total number of other cases treated not enumerated above	2,789	31

Syphilis, in its various stages and manifestations, intestinal parasites, particularly *Ascaris lumbricoides* and *Ankylostoma duodenale*, with catarrhal fevers have been the conditions the district medical officer has been most commonly called on to treat.

Yaws has been less commonly met with in the town of Kingstown since the opening of the Yaws Hospital at Low Point in December last, due to the fact that such cases as have been met with have been sent to the Yaws Hospital while other existing cases are kept out of the way for fear of similar treatment, for while little difficulty presents in getting adults to go, it is not easy to break down the sentimental barrier of parting a mother from her children.

The sanitary condition of the district has been satisfactorily maintained during the year. The streets and thoroughfares of the town, with their drains have been kept in good order and efforts have been frequently made by the Kingstown Board and its sanitary inspectors in anti-mosquito measures, while the occasional occurrence of cases of plague in a near colony has been the incentive to a rat-campaign.

Vigilance is still necessary to prevent the practice which obtains of throwing excreta into the North River, a vigilance that might well be extended to the main drain in Paul's Lot.

Vaccination has been regularly performed each week throughout the year. The total number of successful vaccinations recorded being 135. As every child has by law to be vaccinated within three months after birth, this number out of a total number of 157 births points to a satisfactory condition of protection against small-pox among those of tender years.

No. 1 District.

Population 6,427, births 268, deaths 125.

Prevalence of Sickness in Different Seasons.—The district being non-malarious, gastro-intestinal diseases would be expected to show the principal seasonal variation. But there is not enough dysentery for the figures to be of statistical value; and diarrhœa is so often due to intestinal worms that it is rare to find a case uncomplicated by the presence of these parasites.

Meteorological Conditions Affecting Health.—There is very little to be noted under this head. The last two months of the year, February and March, were exceedingly dry, yet I cannot say that any particular change in the general health could be observed.

Since the Yaws Hospital was opened, 45 cases of this disease have been reported, and many more remain. But a very long time must elapse before all these cases can be treated. It seems likely that the treatment by Ehrlich's "Salvarsan" is the most efficient that we have, and that the use of this drug may render it possible to get yaws under control, a control which would result in a very vast improvement in the health of the Island.

An epidemic of whooping cough started at the beginning of the year, and became very extensive, till the schools were closed. Since then only occasional cases have cropped up. Only one death was recorded by me as due to this disease.

The most unsatisfactory feature of the general sanitary condition is the prevalence of the ova of intestinal parasites in the earth round the houses. A very radical alteration in the habits of the population would be required to abolish this feature.

During the year I have seen 17 cases of pulmonary tuberculosis; on general grounds one might say that this is a disease that need not occur at all in St. Vincent. Sunshine and air will certainly kill the tubercle bacillus, and both are available in large amount. Tubercle bacilli expectorated in the open are probably killed within twenty-four hours.

Consequently the infection must be carried on inside the houses, the inhabitants of which fear fresh air far more than they do the presence of a case of consumption. The regularity with which

windows are shut at nights, the promptitude with which they are closed during the day for a passing shower of rain in the houses of the highest as of the lowest, would be ludicrous if it were not so indicative of an insanitary state of mind.

There were 257 successful vaccinations.

The calf lymph supplied in capillary tubes has been most satisfactory; some specimens of other vaccines supplied for trial were not nearly so certain in their results.

I have seen ten cases of malaria all of which seemed to be imported. Anophelines are rare in the district; measures specifically directed against malaria-bearing mosquitoes can hardly be considered necessary.

There has been a diminution of the number of stegomyiæ since action based on the new Public Health Act has been taken; but there are still enough to make the entrance of yellow fever a real danger.

Name of disease	Number of cases	Number of deaths
Notifiable diseases -		
Chicken-pox	2	—
Cholera	—	—
Diphtheria	1	—
Enteric fever	—	—
Leprosy	—	—
Measles	—	—
Mumps	—	—
Plague	—	—
Small-pox	—	1
Whooping cough	65	—
Yaws	124	—
Yellow fever	—	—
Other diseases –		
Ankylostomiasis	18	—
Anthrax	—	—
Catarrhal fevers	21	1
Diarrhœa, adults	37	1
,, children	68	9
Dysentery	7	1
Filaria	16	—
Malarial fevers	10	—
Malignant new growths	—	—
Pulmonary tuberculosis	17	5
Syphilis	111	1
Tetanus	1	11
Ulcers (except syphilis and yaws)	288	—
Total number of other cases treated not enumerated above	2,812	61

There is some spread of the knowledge that the presence of mosquitoes is unhealthy, but there is not much private endeavour to destroy their breeding places.

Quarantine.—Passengers arriving from South and Central American ports are placed under surveillance for the requisite number of days; no case of quarantinable disease has been detected amongst these, though a considerable number have returned from Brazil.

Small-pox, yellow fever and plague have occurred in colonies of the Quarantine convention; these occurrences have been promptly notified by the colonies in question and the usual precautions taken under the convention at ports of departure and arrival.

The utility of the convention has been greatly improved since it has become compulsory to take certain precautions at the port of departure where *one* case of plague has occurred. I regard this as a very considerable addition to safe-guarding St. Vincent from plague.

I note with pleasure that a reward is offered by the police for the production of rats dead or alive. Some energetic but poor man should surely be able to earn a living by attention to this.

H. B. DODDS,
Medical Officer.

NO. 2 DISTRICT.

The population of the district according to the census taken in 1911 is 8,882. The number of births were 361, number of deaths 153, still-born children 13, giving a birth-rate of 40·8 per thousand and a death-rate of 17·2 per thousand.

The principal diseases in this district are syphilis, yaws, intestinal parasites *Ankylostomum duodenale* and *Ascaris lumbricoides* are commonly met with), dysentery, malarial fevers and ulcers. Syphilis and yaws cause most of the ulcers and also cause anæmia, arterio-sclerosis and general debility. Malarial fevers, which are chiefly met with in the Buccament and Cumberland Valleys in dry weather, were very few this year and of a mild type. Two severe cases of malignant malaria were treated; the parasites were discovered in the blood. The disease was contracted in Brazil. Amœbic dysentery was also prevalent in the dry season in the Buccament Valley, but isolated cases occurred all over the district.

During the month of December, 1910, the mortality was a good deal higher than usual, several sudden deaths occurred, and also diarrhœa and gastro-enteritis in children was more prevalent than is usual.

In the dry season malarial fevers are more prevalent, also diarrhœa and dysentery in some places where the water supply is not good. In other respects I have not noticed that the meteorological conditions affect the general health.

Two cases of diphtheria occurred during the year. They were sent to the Colonial Hospital for antitoxin treatment, and both cases made good recoveries. The usual precautions were taken, and since then no more cases have occurred.

Pulmonary tuberculosis is common amongst coolies and they live under the very worst conditions possible for successful treatment. It is enough to see the houses they inhabit and the food they eat for one to see that any hope of recovery under those conditions is very small. As a rule the disease runs a very rapid course.

An epidemic of whooping-cough started in this district in September, and the number of cases every month gradually increased up to December, when 54 cases were treated. From that time the number decreased.

The schools were closed during the months of December and January, and I have no doubt this helped to stamp out the epidemic.

The general sanitary condition of the district is fairly good, but there is still considerable room for improvement.

The small towns on the coast are as a rule kept fairly clean and most of the villages are satisfactory. During the rainy season it is difficult to keep the villages in a sanitary condition as the vegetation grows so quickly and the uneven nature of the land around the villages retains the water and forms pools, &c., for mosquitoes to breed in.

An excellent water supply will very soon be laid down for Barrouallie, this will be a great benefit to the inhabitants.

Vaccinations were performed regularly each week and the supply of lymph was good and always regularly received once a fortnight from the Colonial Hospital.

The villages and small towns were inspected at regular intervals, and the inhabitants cautioned about keeping stagnant water anywhere on their premises that mosquitoes might breed in.

Name of disease	Number of cases	Number of deaths
Notifiable Diseases—		
Chicken-pox	—	—
Cholera	—	—
Diphtheria	2	—
Enteric fever	—	—
Leprosy	1	—
Measles	—	—
Mumps	—	—
Plague	—	—
Small-pox	—	—
Whooping cough	163	2
Yaws	125	—
Yellow fever	—	—
Other Diseases—		
Ankylostomiasis	90	1
Anthrax	—	—
Catarrhal fevers	55	1
Diarrhœa—Adults	18	—
,, Children	178	13
Dysentery	69	10
Filaria	12	—
Malarial fevers	86	1
Malignant new growths	8	5
Pulmonary tuberculosis	35	10
Syphilis	163	9
Tetanus	4	3
Ulcers (except syphilis and yaws)	223	—
Total number of other cases treated not enumerated above	1,530	55

Some "millions" were put in a swamp at Buccament Bay Village with the idea of getting rid of as many mosquito larvæ as possible; malarial fevers have been very much less this year in that particular village than at the corresponding period last year, but malaria seems to be so very much less this year everywhere that it is difficult to say how much good the "millions" may have done.

It would be well to stock the pools and swamps in the vicinity of malarious villages with some natural enemy of mosquito larvæ (fish). The expense would be small and some good results would be sure to follow.

It is thought that *Cellia argyrotarsis*, which is well known in this island to breed in crab holes, carries malaria; in that case the filling up of crab holes would be likely to have good result.

THOS. H. MASSEY,
Medical Officer.

No. 3 DISTRICT.

Population, Births and Deaths.—The population of this district is distributed as follows:—

In the Mesopotamia Valley	1,947
Stubbs, Enhams, Carapan, Rivulet	1,828
Calliaqua, Villa, Glen and Fair Hall	1,569
Evesham District, from Reilly's Village to Aker's Hill	1,267
Brighton, Belvidere, Prospect, Choppins	1,248
Argyle, Escape, Peruvian Vale, &c.	788
Gomea, Ashburton, Dauphine	656
Belmont, Whim, &c.	431

This shows that the Mesopotamia Valley is the most populous part of this district; with Stubbs, Calliaqua, Evesham and Brighton districts next in the order named. Roughly, 4,000 people live north of the Vigie Ridge and 6,000 south of it.

The total number of births for the year was 401, including 25 still-born children, 196 were legitimate, and 205 illegitimate. This gives a birth-rate of 41·19 per thousand. Children under 5 accounted for 64 per cent. of the total deaths, and children of 1 year and under were 47 per cent. of the total.

Name of disease	Number of cases	Number of deaths
Notifiable diseases—		
Chicken-pox	—	—
Cholera	—	—
Diphtheria	1	—
Enteric fever	—	—
Leprosy	1	—
Measles	—	—
Mumps	—	—
Plague	—	—
Small-pox	—	—
Whooping cough	26	4
Yaws	41	—
Yellow fever	—	—
Other diseases—		
Ankylostomiasis	36	2
Anthrax	—	—
Catarrhal fevers	4	—
Diarrhœa—Adult	14	2
,, Children	128	33
Dysentery	16	3
Filaria	14	—
Malaria fevers	39	2
Malignant new growths	6	1
Pulmonary tuberculosis	12	5
Syphilis	133	11
Tetanus	5	5
Ulcers (except syphilis and yaws)	49	—
Total number of other cases treated not enumerated above	1,639	74

Infant mortality, measured by the proportion of deaths amongst children under 1 year to registered births, was 132 per 1,000.

Diarrhœa caused the death of 26 children under 1 year, and of 5 children between 1 and 5. Worms caused the death of 11 children under 1 year, and of 24 children between 1 and 5.

In this district, the most frequent diseases are worms, the diarrhœa of children, and syphilis.

Whooping-cough broke out during the last quarter of 1910, and there were 4 deaths out of 26 cases which came for treatment from November, 1910, to March, 1911. The majority of these cases took no medicine, and treated themselves.

Colonial Medical Reports.—No. 46.—St. Vincent (*continued*)

All the cases of pulmonary tuberculosis were met with in the first half of the year; they never recover, and rapidly die. The new Public Health Ordinance, and the Yaws Hospital, should do much to stamp out the disease of yaws. Salvarsan will probably be a great help in stamping out yaws, by vaccination treatment, just as small-pox is vaccinated against.

So long as the mothers of the children persist in giving them arrowroot, and allow them to play in the dirt round the houses, the high mortality from diarrhœa and worms will continue. Children infect themselves with worm eggs by putting their dirty fingers in their mouths, and drinking impure water and impure goat's milk. The soil round the houses is infected by the drainage from the stools of other worm-infected children, therefore the sanitary condition of the ground round the houses should be attended to, and children should not play there. Goat udders should be carefully washed before milking, and all milk and water should be boiled before use. Girls at school should be taught to recite by heart the card of hints to mothers, and they should be given lessons in simple cookery to prepare them for their duties as wives hereafter, and to help to lessen the cases of dyspepsia, which is one of the great troubles of the black labourer, and is caused by his eating starchy and badly cooked food, at irregular hours.

The general sanitary condition of the district is good. River water is usually unfit for drinking, especially if taken below a village.

Under the new Public Health Act, the people are held responsible for keeping the bush cut round their houses, but it is difficult to see how these cases are to be discovered when there are no sanitary inspectors appointed by the Government. The police will not prosecute, unless compelled to do so.

There were 386 successful vaccinations during the year.

Anti-malarial and Anti-mosquito Measures.—The bush in the villages was cut when necessary. Pools do not exist, water-butts do. The sand bar at the mouth of the Calliaqua River was cleared when required.

Under the new Public Health Act, persons who are found with mosquito larvæ on the premises are liable to prosecution. This district is not malarious, except perhaps at Calliaqua, where the land is below the level of the sea and is full of crab holes.

During the year, the out-district medical officers were provided with microscopes by the Government —an excellent move.

G. B. Mason,
Medical Officer.

No. 4 District.

Of a population of 5,700 people, the number of births during the year was 249, and the number of deaths 107. The birth-rate per thousand was 43·6, and the death-rate 18·7.

Infantile mortality entered materially in swelling the death-rate.

Prevalence of Sickness in the Different Seasons of the Year.—During the month of May one case of diphtheria occurred in a child, aged 3. The case was promptly sent to hospital for isolation and treatment, and speedily recovered.

In the month of November there were two cases of bilious remittent fever, which took place at Park Hill; one of them succumbed after three days' illness, and the other recovered after a protracted illness.

In December, January, and February cases of influenza occurred throughout the district; these were of a mild type, and did not develop serious complications.

A few cases of whooping-cough occurred, too, among children; no fatality ensued.

Cases of yaws exist in the district, chiefly in Lowmans, Chapmans and Diamond villages. Uncinariasis is fairly common in the No. 4 district.

Name of disease	Number of cases	Number of deaths
Notifiable diseases—		
Chicken pox ..	—	—
Cholera ..	—	—
Diphtheria ..	1	—
Enteric fever ..	—	—
Leprosy ..	—	—
Measles ..	—	—
Mumps ..	—	—
Plague ..	—	—
Small-pox ..	—	—
Whooping cough ..	2	—
Yaws ..	13	—
Yellow fever ..	—	—
Other diseases—		
Ankylostomiasis ..	28	—
Anthrax ..	—	—
Catarrhal fevers ..	124	6
Diarrhœa—Adults ..	11	3
,, Children ..	99	23
Dysentery ..	10	3
Filaria ..	9	—
Malarial fevers ..	11	1
Malignant new growths ..	3	—
Pulmonary tuberculosis ..	12	4
Syphilis ..	138	8
Tetanus ..	6	2
Ulcers (except syphilis and yaws) ..	76	1
Total number of other cases treated not enumerated above ..	1,133	21

Among children diarrhœa, intestinal parasites, and inherited syphilis were the principal ailments attended to.

In adults the chief diseases met with were dyspepsia, anæmia, syphilis—chiefly in the tertiary stage, a few cases of primary syphilis were seen, too; valvular disease, rheumatism, debility, numerous ulcers—most of them of a specific origin; cases of chronic bronchitis, chronic Bright's disease, a few cases of pulmonary tuberculosis, a few filaria and tetanus in the newly born, also a few nervous ailments.

During the year there were frequent downpours of rain about the months of December and January; there was a change in the weather with very cold

mornings and evenings—this accounted for cases of influenza which occurred about that time.

The sanitary condition of the district was good. The various villages were kept clean, thickened vegetation trimmed, and drains cleared and opened.

At Colonarie a tank was laid at the police station for collecting rain water. This is much appreciated.

The number of successful vaccinations carried out was 230. The lymph supplied was good, and gave satisfaction.

P. F. Cremona, M.B., Ch.B.
Medical Officer.

No. 5 District.

In the month of April, 1911, a much needed Census was taken; this had not been done during the last twenty years. The volcanic eruption with its numerous fatalities coming in the interim, introduced a great deal of uncertainty in the "excess of births over deaths" method of estimating the population. The Census returns show this to be 3,758.

The number of houses are 874, making an average of 4·29 souls to each dwelling. It would have been interesting and at the same time instructive to have ascertained the cubic space of these dwellings, which should be large enough to allow of the entrance of 3,000 cubic feet of air per head per hour without perceptible draught. The most liberal estimate will fall short of this figure. This is to be regretted, for in the Tropics, where both skin and lungs play such an important part in the elimination of toxic products from the body, the air in a room rapidly becomes vitiated unless frequently changed. Add to this the pernicious habit of the peasant to obliterate all possible sources of ventilation at night, a condition of affairs is arrived at which is far from being hygienic.

Deaths.

An analysis of the total number of deaths shows the following:—

Infants (2 years and under)	39
Adults	10
Aged (over 60 years)	13
Total	62

Infant Mortality.—Under this heading are included all deaths occurring during the first two years of life. This we see is large—39—more than half the total number of deaths.

The majority of patients who did not apply for medical advice is made up of children under 2 years of age and therefore were entitled to free medical attendance under the Medical Relief Scheme. It is an index to the indifference of the parents towards their children. They have no excuse whatever; had they a fee to pay one might be inclined to be lenient and put that down as the cause, but this is not so, for even in the case of adults, any demands for pecuniary remuneration are as a rule met with studied indifference.

I think that severe measures should be adopted in order to reduce the high rate.

I should like to emphasize one ætiological factor—improper feeding—the deleterious effect of which upon an infant is frequently evidenced in the case of a mother employed as a labourer on an estate continuing her work during and especially shortly after pregnancy. The child is frequently left to be attended to by a brother or sister just a few years older. It often does not get milk, but milk and bread-slops from the first, or water, sugar and bread-slops which the parents call "tea." A mother who must work in the fields or factories ought certainly to have at least one month's holiday after she is past the puerperium, in order that she may nurse the child herself at regular intervals instead of at any time that she may happen to "drop in" from her duties; after that the infant is not quite so dependent upon the mother's milk and will thrive if good cow's milk appropriately diluted were substituted. This is the

Name of disease	Number of cases	Number of deaths
Notifiable diseases—		
Chicken-pox	6	—
Cholera	—	—
Diphtheria	6	—
Enteric fever	—	—
Leprosy	5	—
Measles	—	—
Mumps	—	—
Plague	—	—
Small-pox	—	—
Whooping-cough	509	16
Yaws	388	—
Yellow fever	—	—
Other diseases—		
Ankylostomiasis	231	4
Anthrax	—	—
Catarrhal fevers	386	12
Diarrhœa—Adults	108	8
„ Children	668	93
Dysentery	127	19
Filaria	82	1
Malarial fevers	201	6
Malignant new growths	25	8
Pulmonary tuberculosis	113	29
Syphilis	855	53
Tetanus	22	15
Ulcers (except syphilis and yaws)	741	2
Total number of other cases treated not enumerated above	11,978	267

age when the seeds of the gastro-intestinal disorders which so frequently have a lethal issue are sown. A few months later plantains, yams and similar vegetables form the major portion of the infant's dietary. The parents' ideas as regards infant feeding would be difficult to view with becoming seriousness but for the fact that they frequently cause a fatal end. I make it a rule to go into the subject when they bring their children to be vaccinated. I try to instil the necessity of feeding the child on milk and milk alone, suitably diluted, during the first four months at least of its existence. I advise that the milk should be given neither boiled nor raw, but scalded. That may appear to be a distinction without a difference, but by scalding I mean raising the milk to the boiling point, or just short of that, and then taking it off the fire. The objection to boiling the milk is that there is a very slight risk of producing scurvy by it. The only indication for changing such a diet is either the

loss of or failure to gain weight on the part of the child.

Infants under this category have a high mortality from malnutrition, popularly called "Marasmus," diarrhœa and infantile convulsions resulting from gastro-intestinal disorders.

When it is remembered that each healthy adult is an asset to the colony a crusade against this "slaughter of the innocents" may be deemed advisable.

The general sanitary condition of the district is good. On my arrival here there were an inordinate number of trees in the town. A good many of them have lately been effectively removed.

The number of successful vaccinations was 170.

I have not had any cases of endemic malaria in my district. This is accounted for by the fact that there are no swamps about, the surface soil being of a very sandy nature, thereby readily allowing the water to percolate through.

CONRAD J. ARTHUR,
Medical Officer.

Colonial Medical Reports.—No. 47.—Seychelles.

MEDICAL REPORT OF SEYCHELLES FOR THE YEAR 1911.

By J. B. ADDISON.
Chief Medical Officer.

VITAL STATISTICS.

THE estimated population of the Colony was at the end of the year 23,105, being an increase of 485 on that of last year.

The birth-rate for the year was 31·94 per thousand; the preceding year it was 31·35.

The death-rate was 15·79 per thousand; last year it was 16·28 per thousand.

The deaths this year for the Colony compares favourably with former years; the death-rate for the last five years gives an average of 15·6 per thousand.

The infantile mortality, *i.e.*, children under 5 years, was 127, and was also lower than the number who died in 1910 by 22.

METEOROLOGICAL STATISTICS.

The mean temperature for the year was 79·3° F., which is about the same as in former years.

April was the hottest month, having a mean temperature of 80·8° F., the coolest months of the year were July and August, with the same temperature, 77·6° F.

The rainfall of the year was lower than the preceding year, and may be considered to be a dry year, only 77·31 in. of rain were recorded for the year.

January, February and November were the months in which rain fell the most. December, compared with former years, was a dry month; only 5·94 in. of rain fell.

The South-East trade winds blew with an average force during the year; they were settled and blew regularly from July to October.

DISEASES PREVALENT DURING THE YEAR.

There were during the year no epidemics. Tuberculosis of the lungs accounted for a certain number of deaths, but there was no marked increase in the number of cases.

The number of cases of beriberi was greatly diminished. St. Pierre Island, on which severe outbreaks had taken place in previous years, was practically free; this was without doubt due to the fact that the proprietors of the Island had substituted Bengal for Saigon rice in the rations given to the men.

A curious form of skin disease, the nature of which is not quite clear, and of which there have always been cases in people living in the outlying islands, was much more common during the latter half year of 1911.

The disease attacks adults of both sexes; it appears to be more common in men, but this is doubtless due to the fact that far more men than women go to the outlying islands.

I do not remember having met with a case in an individual who had not been to these islands, but on the other hand have met with cases in which the disease has not commenced until after their return to Mahé, and in one or two cases several months after.

The disease is named by the natives *décoque*, and this expresses the condition very well. In men it usually affects the skin of the scrotum in the first place; the skin becomes dried up and cracked and peels off in large, thick flakes, the condition gives rise to considerable burning and itching, and is accompanied by considerable depression. After the scrotum the regions most generally attacked are the face, especially the commissures of the eyes and mouth, and the neck, the rest of the body being only attacked in the severest cases, although in many of the cases the skin of the rest of the body is roughened and unhealthy looking.

Two cases in women were observed in which the skin of the entire body became affected, the patients looking as though their skins had been dried up by

gradual heat until they cracked in all directions; both these patients died apparently from exhaustion.

In his report the Assistant Medical Officer, South Mahé, states his conviction that the reason why malaria is not found in Seychelles is not due so much to the fact that the anopheles mosquito is never present in Seychelles as to the presence of the quantity of small fish which inhabit the rivers and pools which would be the breeding-places of the anophelines; these would act in the same way as the "Millions" of Barbadoes. The theory is interesting, but under this theory it would be difficult to explain why the anopheles should not breed in such places as Long Island Quarantine Station; this would perhaps be the most likely place for anopheles to be deposited, but here the water is only found in springs, at the mouths of which pools of water are found quite suitable for the breeding of anophelines, but in these pools are no fish. If anophelines were present at Long Island an epidemic of malaria would surely break out, as here we have ideal conditions for it, that is to say, good breeding-places for the mosquito, with no fish, and people coming direct from malarial countries and infected with malaria; but malaria has never occurred at Long Island Quarantine Station, which is used as a health resort by people in Mahé. I think there must be some further reason than the fish in the rivers to explain the absence of the anopheles and malaria in Seychelles.

The vaccine lymph, which is received monthly, continues to give excellent results.

The children vaccinated during the year in the Colony numbered 555, all of which were successful.

The labourers that are employed to discharge cargo in the harbour have all been vaccinated, and are now and then revaccinated in order to reduce as much as possible the risk of infection from small-pox.

The quarantine station was used nearly every month during the year. Deck passengers arriving from Bombay were landed at Long Island to undergo the full period of quarantine for small-pox, which prevailed at Bombay in a sporadic form.

The Health Officer under this Ordinance is allowed, with the approval of the Quarantine Committee, to put a vessel in partial quarantine which carries a bill of health annotated with a disease in a sporadic form, and is allowed even if a vessel carries a clean bill of health to put her in quarantine if he considers it advisable. First and second class passengers are allowed to land, but deck passengers who are suspected to carry infection are put in quarantine.

The sterilizer on Hodoul Island is as usual doing a lot of work in sterilizing passengers' effects and also gunny bags from plague-infected ports.

South Mahé.

The health of the district was good. There were three deaths from pulmonary tuberculosis; in 1910 there was no death, but the disease is not making headway. This disease is common, and more so amongst the underfed whites than the black people. I consider it necessary that boots or at least some protection for the feet should be worn by these people, as the worms gain entrance by the skin and principally in the lower extremities. The poverty of certain classes of the white or coloured population compels them to go barefooted, with the result that anæmia due to ankylostomiasis is quite common in this class of the population.

I am sure that the immunity in Seychelles to malaria is not due to the absence of anophelines. There is no doubt that at times the mosquito gets into the colony. It is due to the immense number of little "gudgeon" with which the rivers are swarming; they range in size from a quarter of an inch to one inch in length. The anophelines will only breed in clean water and their eggs and larvæ are destroyed by these little fish, so if by any chance anophelines do come in, they are unable to propagate. On the other hand *Culex* and *Stegomyia* are quite common here. *Stegomyia* is a house breeder and will use any old tin where water lodges; *Culex* generally prefers the marshes, but neither of these mosquitoes requires clean water like anophelines.

The principal diseases causing death were dysentery 2, endocarditis 4, infantile marasmus 8, meningitis 5, pulmonary tuberculosis 3, senile decay 9, and tertiary syphilis 2. Eleven children under 1 year of age died, and under 5 years nineteen children.

It is proposed to have a small hand ambulance at Anse Royale Dispensary in order to convey serious cases to the Victoria Hospital; this will be a boon to the inhabitants, as the present mode of conveyance by pirogue causes a lot of undue suffering and pain to the patients,

John Thomas Bradley,
Assistant Medical Officer, South Mahé.

Lunatic Asylum.

The inmates enjoyed good health during the year, there was no outbreak of any contagious or infectious disease. During the year 4 male patients died, but 2 of these were practically in a dying condition on entry.

During the year 4 male and 3 female patients were admitted; there was no case of second admission.

There were discharged as recovered 2 males and 1 female, and 1 female out on trial who may be also looked upon as recovered.

Four males died during the year; the causes of death were syphilis, meningitis, endocarditis, and exhaustion with senile decay.

Patients were taken out for a weekly walk, there is a dance once a week, also magic lantern performances; in addition there are provided in the wards games such as cards, dominoes, and draughts. Few of the patients can read or write, but they are always glad to get illustrated and picture journals.

In the male side some patients are kept at work in the vegetable garden, while others plant flowers and keep the wards clean, while one helps the cook. In the female side the patients sew and do all the repairs of the Asylum, as well as cut and make the clothes of the inmates.

John Thomas Bradley,
Medical Superintendent, Lunatic Asylum.

Colonial Medical Reports.—No. 47.—Seychelles (*continued*).

PRASLIN.

The health of Praslin Island has been very good during the year and there have been no epidemics.

The two Government Dispensaries have been well attended, but the cases have been mostly of a chronic nature, such as rheumatism, &c.

In my private practice the most frequent diseases noticeable have been gonorrhœa, syphilis, fibroids and various forms of enteritis. Asthma and hernia are also common. With regard to this last disease, I would respectfully submit that a small hospital is absolutely necessary, as strangulation is very frequent and the inevitable delay, consequent upon sending patients to Mahé for operation, has caused the loss of several valuable lives. There was one death this year from that cause, the patient being a fine boy of 18 years, who died at the hospital in Mahé after a protracted journey across. Other patients have previously died from the same cause, since, during the North monsoon, the sailing boats, which are the sole means of inter-insular communication, with the exception of the steamer "Alexander," which calls about every ten days during this monsoon, are sometimes four or five days at sea.

There have been no cases of tropical disease, unless one can so term ankylostomiasis, which is common.

Sixty-two children were vaccinated in Praslin during the year. Of these, 61 were successful the first time, and the remaining one was successful on the second vaccination.

During 1911, there were 82 births in Praslin and 6 still-births. There were 36 deaths.

The population of Praslin, estimated from the Census taken during 1911, was 2,018. This gives a birth-rate of 40·63 and a death-rate of 17·83.

Round Island is, however, considered as part of Praslin for the purpose of estimating these statistics. The Praslin death-rate, minus that of Round Island, is only 13·37.

LA DIGUE.

This island is never so healthy as Praslin owing to the greater density of population. Ankylostomiasis is very common, almost one-third of the entire population being affected.

Gonorrhœa and syphilis are much more prevalent at Praslin. With these exceptions, the distribution of diseases at La Digue is practically similar to that of Praslin.

The dispensary is but poorly attended, as there are practically no paupers at La Digue.

Fifty-eight children were vaccinated on the island during the year. Of these, 56 were successful the first time and 2 were successful upon revaccination.

During the year there were 46 births and 5 still-births in La Digue, and the deaths numbered 31.

As in the case of Praslin, the cause of death was, in most cases, declared by the relatives and I cannot, therefore, vouch for its accuracy.

The population of La Digue, according to the Census taken in 1911, was 1,364. This gives a birth-rate of 33·73 and a death rate of 22·73.

ROUND ISLAND.

The number of inmates of the pauper and leper camps on this island remains unchanged, the influx having exactly balanced the vacancies caused by deaths and discharges. At the beginning and end of 1911 the inhabitants numbered 29.

The inmates are, almost without exception, old persons, indeed, many are cases discharged from the hospital at Mahé as incurable, hence the death-rate is high, while the birth-rate is nil.

There were 9 deaths on the island during 1911.

During the year, fruit trees and vegetables have been planted on the island, for the dual purpose of giving a dietary change to the paupers and lepers and of cutting down the expenses of the island, the upkeep of which is now becoming considerable.

A new pirogue has been made this year for the purpose of carrying water. There is no water supply on the island, hence daily supplies have to be taken from Bay St. Anne, or, when the weather is bad, from Anse Lafarine, which is nearer, but where the water supply is neither so good nor so plentiful.

Two small chapels were also built on the island this year, one for the Protestants and one for Roman Catholics, and the overseer reads prayers every Sunday for the benefit of the paupers.

There are at present nine lepers on the island in an isolated camp. Despite the terrible disease from which they suffer these people are the most cheerful and contented on the island.

A trial is being given to the Nastin treatment and six of the patients have already been given a six months' course. The results are most encouraging, as the patients, at first inclined to resist the treatment, now all express themselves as having derived much benefit from it and are most anxious for it to be continued.

The Nastin has certainly successfully healed up some chronic ulcers, which had been open for ten years and more, while the gain in the general bodily health of the lepers is considerable. Before the commencement of the treatment the lepers were always wanting medicine for various ailments, but since this Nastin course began there have been no complaints at all. A second six months' course is now being started and it is to be hoped that the results will be equally satisfactory.

The overseer has worked well during the year and has helped considerably in making the lot of the paupers and lepers as happy and contented as possible.

N. P. JEWELL,
Assistant Medical Officer, Praslin.

Colonial Medical Reports.—No. 48.—Saint Vincent.

MEDICAL REPORT, KINGSTOWN DISTRICT, FOR THE YEAR 1911-1912.

By **CYRIL H. DURRANT, M.B.**

Medical Officer, Kingstown District.

The population of the Kingstown district, which comprises the town of Kingstown and the adjacent village of Edinboro', was 4,708.

There were 187 births and 81 deaths, giving a birth-rate of 39·7 per 1,000 and a death-rate of 17·2 per 1,000. There were 18 stillbirths recorded. Of the 187 births recorded, 76, or about 40 per cent., occurred at the maternity ward of the Colonial Hospital.

The deaths occurring at the institutions are not included in these figures but are accounted for in the report on charitable institutions. The total number of deaths, including those at the institutions, was 182, 5 less than the number of births.

Sickness was most prevalent in the July-September quarter, attributable to an outbreak of "epidemic influenza," which ran through the district, 205 cases being treated at the district dispensary at the Colonial Hospital during the quarter.

The epidemic was on the whole mild in type, but several severe and complicated cases found their way into the Colonial Hospital for treatment; reference to the classification of diseases at that institution showing 10 admissions for influenza with 1 death, and 14 admissions for pneumonia with 4 deaths.

Concurrently with this outbreak of "epidemic influenza" a mild epidemic of measles made its appearance, 45 cases being recorded between the months of May and December. The epidemic of measles followed closely on the heels of last year's epidemic of whooping-cough, these two old friends maintaining their desire to pursue one another, as has so often been noted.

Malarial fevers were slightly more numerous than attended last year, 53 cases attending for treatment as against 47 in the previous year.

Gastro-enteritis in children accounted for 55 cases with 16 deaths as against 51 cases with 7 deaths in the previous year. The greater number of deaths is probably due to the fact that many of these cases were sequelæ of measles or influenza, and account for the greater mortality in these cases, debilitated by recent zymotic diseases.

Syphilis, in its various phases, intestinal parasites and catarrhal fevers, have been the conditions the district medical officer has been most commonly called on to treat.

The sanitary condition of the district has been on the whole satisfactorily maintained during the year. The streets and thoroughfares of the town with their drains have been kept in fair order and the Local Health Authority, with its sanitary inspectors, has directed its attention to anti-mosquito measures; a case of yellow fever, occurring in one of the out districts, being the incentive to a general mosquito campaign in February last. Measures have also been directed towards the destruction of rats, and rewards are still being paid for rats brought to police headquarters.

Vaccination has been regularly performed each week throughout the year, the quality of the lymph supplied giving perfect results, the total number of successful vaccinations recorded being 122 out of 187 births. Of the 65 children unaccounted for, some have been vaccinated by private medical practitioners, while others, born in the maternity wards of the Colonial Hospital, have returned to their country homes and been vaccinated by district medical officers.

A satisfactory degree of protection against smallpox exists among those of tender years.

No. 1 District.

The population of the district is 6,500; births, 292; deaths, 151.

The four months, July, August, September and October, showed a greater number of cases treated than did the other months. These are the rainy and hot months. But none of the figures for any special disease is sufficiently large to enable a judgment to be formed of the effects on health of varying rainfall and heat except in a general way.

The following Table shows the distribution of mortality:—

April	7	July	12	October	12	January	14
May	15	August	13	November	16	February	16
June	13	September	11	December	13	March	9
	35		36		41		39

Ten cases of malaria were diagnosed and treated; as far as could be ascertained all these were imported from outside District No. 1.

About July and August there was a very extensive epidemic of measles, a few cases cropping up again in December. The disease was of a remarkably mild type, though there seemed to be no immunity to it.

The epidemic of whooping-cough which began last year finished in April, 1911; it also was mild in type; 112 cases of yaws have been reported to the Medical Superintendent of the Yaws Hospital. Already, I think, fewer cases are presenting themselves for treatment.

The chief diseases due to lack of sanitary precautions are those caused by intestinal parasites; these could be entirely eliminated if intelligent action could be taken by an educated population.

Yaws and pulmonary tuberculosis could almost certainly be abolished in the same way. Diseases

carried by mosquitoes can only be done away with by concerted action and an intelligent willingness on the part of those on whose behalf such action is taken

The gastro-intestinal diseases of children, apart from worms, are due to poverty, ignorance and ill-feeding. Much remains to be learnt by parents.

Two hundred and twenty-five successful vaccinations were performed.

From the middle of February to the end of March, 1912, a regular inspection for mosquito breeding places was undertaken in the suburbs of Kingstown. The weather at the time was fairly dry, but a few roadside ditches were found to contain culex larvæ, as shown by allowing them to develop in glass jars.

The chief attention, however, was directed to breeding places in and around houses; in some places these were very numerous; as often as possible they were emptied out on the spot. After several rounds had been made, some improvement was noted; but there can be no doubt that the only way to eliminate the household mosquito is the provision of standpipes, along with some inspection, or a very strict and regular inspection alone. In the meanwhile, occasional inspection is being carried out.

One case of yellow fever occurred in Georgetown in February; no further case occurred nor any other case of quarantinable disease; accordingly the colony has been "healthy" throughout the year.

Passengers from Central and South American ports have been kept under surveillance according to the provisions of the Quarantine Ordinance. Cases of "infectious disease" have occurred in convention colonies and the usual precautions taken in these colonies and in St. Vincent.

I draw attention, as I did last year, to the addition to the safety of convention colonies since it became compulsory, after one case of plague, to fumigate ships at the port of departure.

If all rats, especially those found in harbours, could be destroyed, there would presumably be no danger at all from plague; just as if all stegomyiæ were prevented from breeding there would be no danger from yellow fever.

H. B. Dodds,
Medical Officer.

No. 2 District.

The population of the district according to the Census taken in 1911 is 8,882. The number of births was 354, number of deaths 146, stillborn children 18, giving a birth-rate of 39·8 per 1,000 and a death-rate of 16·4 per 1,000.

In this district the diseases commonly met with are syphilis, dysentery, malarial fevers and worms. Two cases of malignant malaria were seen; the parasites were discovered in the blood.

Gastro-intestinal diseases amongst children are common in this district, and I have noticed that the number of cases are always increased during the dry season. Diarrhœa is very often complicated with worms, and except in the case of young infants it is rare to find a case where these parasites are absent.

Cases of pulmonary tuberculosis occur and the disease as a rule is far advanced before the patient applies for treatment, the prognosis as a rule is extremely bad, and the disease runs a very rapid course. Fifteen cases were seen during the year.

Relative mortality during the different seasons:—

To June 30, 1911 ..	37	To December 31, 1911	27
,, September 30, 1911	54	,, March 31, 1912 ..	28

In the dry season malarial fevers, dysentery and diarrhœa are, as a rule, more prevalent than during the rainy season. In other respects I have not noticed that the meteorological conditions affect the general health.

A severe epidemic of influenza spread throughout the district in September. This disease was very infectious judging from the rapidity with which it spread; a large proportion of the inhabitants of all classes and all ages were attacked.

Whooping-cough, which was endemic in this district since September, 1910, disappeared in November, 1911. A few cases were seen during the early months of the year, principally in the inland villages, which were infected after the disease had spread along the coast.

A few cases of measles were seen during the early part of 1912, from the villages in the Buccament Valley.

The general sanitary condition of the district is fairly good.

The small towns and villages were inspected several times during the year, the thickened vegetation trimmed, drains opened, &c.

In the early part of 1912 a corporal of police was appointed in each small town of this district as sanitary inspector; his duty was to see that no persons kept stagnant water on their premises, also to direct the people's attention to the necessity of keeping their yards, &c., in a sanitary condition.

Three hundred and sixteen successful vaccinations were performed during the year. The lymph was good and always regularly received once a fortnight from the Colonial Hospital.

This district is malarious in certain places, namely, Buccament Valley, Cumberland, Layou, Rutland Vale, but cases are occasionally seen from the other small towns and villages which very often are contracted in Trinidad.

Some quinine chocolate given to me by Dr. Durrant from the Colonial Hospital was distributed to children suffering from malaria with good results.

The knowledge that mosquitoes carry "fever" is now fairly well known amongst the inhabitants, but very little energy is shown by the people to destroy their breeding places.

Thomas H. Massey,
Medical Officer.

No. 3 District.

According to the Census taken on the night of April 2, 1911, the population of this district was 9,734. From April 1, 1911, to March 31, 1912, the total births in this district have been 408, and the total deaths 168, including 14 stillbirths, in both cases. Therefore, the estimated population on April 1, 1912, is 9,974.

Infant mortality is measured by the proportion of

deaths of children under one year to each thousand registered births.

	Percentage of Deaths		Deaths from Diarrhœa		Deaths from Worms	
	Under 5 years old	1 year and under	Under 1 year old	1—5 years old	Under 1 year old	1—5 years old
1911-12	108 = 65·85 per cent.	62 = 36·9 per cen t.	19 = 30·64 per cent.	6 = 5·55 per cent.	6 = 9·67 per cent.	27 = 25 per cent.

There was an epidemic of whooping-cough during the year 1911-12, which lasted from April to December. The total deaths from this cause were 22, which accounts for the high infant mortality. It was found necessary to close the schools for a short time in the worst part of the epidemic.

There were several cases of influenza during September and October. The greatest number of cases of infantile diarrhœa (21) occurred in September. There were 16 in December, 1911, and January, 1912, and 15 in March, 1912.

The deaths were distributed as follows:—

1911.—April 16, May 13, June 16, July 12, August 12, September 13, October 14, November 8, December 20.

1912.—January 18, February 13, March 13.

The meteorological conditions affecting the general health are the rainfall and the temperature. The fewest deaths occurred in July and August, the driest and hottest months; and the greatest number in December and January. In November there were only 8 deaths.

Besides the whooping-cough and influenza referred to, there were 55 cases of yaws; 125 cases infantile diarrhœa, 34 cases dysentery, 8 cases tetanus, and 64 cases syphilis.

The general sanitary condition of the district is good.

There were 408 births and 360 successful vaccinations during the year. A few re-vaccinations were required.

The total number of cases seen in 1911-12 was 2,511, with 168 deaths.

During the yellow fever campaign in February, 1912, caused by a single case of yellow fever in Georgetown, whose origin was unknown, the bush was cleared in the villages, and pools of water drained. The sand bar at the mouth of the Calliaqua River was cleared when required.

The Government has, recently, allowed to the people the free use of the telephone when they require the services of the medical officers. This should prove a great boon to the people, and be a great convenience to the medical officers in arranging the work of their districts.

G. B. Mason,
Medical Officer.

No. 4 District.

The population of this district is 5,700. The number of births for the year was 272 and the number of deaths 105. There were 16 stillbirths registered through midwives' certificates.

The birth-rate per 1,000 was 47·7 and the death-rate 18·4.

As compared with the preceding year there is a slight decrease in the number of deaths and accordingly in the death-rate, the number of deaths for last year having been 107, and the death-rate 18·7.

The common conditions met with in children have been those of gastro-enteritis, intestinal parasites and inherited syphilis, either existing simply or two or all three above conditions complicated. This gastro-enteritis resulting in a diarrhœa, with emaciation sometimes, is the result of the injudicious feeding of the infant.

Among adults dyspepsia was a common condition attended to, many cases having been treated. Many cases of chronic syphilis were also treated. Acute infective urethritis seems to be a rare condition. Three cases were all that came for treatment. Catarrhal fevers were numerous.

Other cases treated were those of uncinaria, numerous cases of ulcers, most of them having been syphilitic. Of eye affections pterygium is a common condition here. A few cases of trachoma were treated too.

The following is the relative mortality in the different seasons: First quarter, 20 deaths; second quarter, 25 deaths; third quarter, 32 deaths; fourth quarter, 28 deaths.

The rainy season began early in the month of April. During the months of July and August it was very hot on this coast. There is usually a fresh breeze on this part of the Windward coast, and with its ozone it exerts a very healthy influence and is beneficial, especially for people suffering from pulmonary tuberculosis, an ailment which I am glad to state is rare here. The highest rainfall for the year was in the month of August, when 13·60 inches were registered at the Cedars. The month of September had a rainfall of 12·99 inches. During this month for five days it rained incessantly. The rain was accompanied by severe thunderstorms and culminated in a flood which destroyed part of the crops and stock. Just about this time cases of influenza came for treatment.

During the months of May, June, July and August there was an outbreak of whooping-cough with one fatality. These cases were confined to Colonarie, Diamond and Park Hill and did not spread throughout the district.

In December and January influenza occurred here. The cases were of a mild type.

Malaria is a very rare condition here. A few cases of filaria were attended to throughout the year. The general sanitary condition of the district was good.

One yellow fever case was reported from the No. 5 District, adjoining No. 4, and accordingly further sanitary measures were carried out in this district; the villages were all scrupulously inspected and kept clean and vegetation thinned out.

The number of successful vaccinations carried out during this year under review was 170.

The lymph supplied by the Government still continues to give good results.

P. F. Cremona, M.B., Ch.B.
Medical Officer.

Colonial Medical Reports.—No. 48.—St. Vincent (*continued*).

No. 5 District.

The census taken last year showed the population of this district to be 3,758.

This being an intercensal period the population has been arrived at by noting the increase of births over deaths, no attention being paid to immigration.

For the year ending March 31 there were 170 births, showing an increase over the previous year by five. Birth-rate per 1,000, 44·11; death-rate per 1,000, 12·45.

An analysis of the total number of deaths shows the following: Infants (2 years and under), 32; adults (3 years to 60 years), 9; aged (over 60 years), 7.

Of this total number of 48 there were no less than 32 deaths occurring in children 2 years and under, and I have no doubt that had they been properly cared for over 50 per cent. of them would have been saved.

Deaths.—Diarrhœa, 11; congenital syphilis, 7; broncho-pneumonia, 8; gastritis, 3; enteritis, 1; intestinal parasites, 1; cerebro-spinal meningitis, 1.

Had the children who died from the gastro-intestinal disorders, viz., diarrhœa, gastritis and enteritis, been properly fed they would probably never have contracted the disease; further, had they received medical attendance at the outset of their disease instead of when nearly dead, the issue in most cases would have been different. The same applies to the cases of broncho-pneumonia. They all began with bronchitis, which, being neglected by the parents, developed into a pneumonia, thereby causing the death of the children. Of the adults, one case was gastric cancer, two cases were cardiac, one pulmonary tuberculosis, two diarrhœa (children 3 years old), one congenital syphilis (child 4 years old), one cerebral hæmorrhage, secondary to syphilis, and one nephritis.

Of the aged: One (94 years) was of senile gangrene, one (64 years) was of carcinomalous prostates, one (72 years) was of filaria, one (61 years) was of cardiac disease, one (73 years) was of cystitis, one (71 years) was of peritonitis, secondary to dysentery, one (75 years) was of syncope due to debility.

The months of May and June brought me the greatest number of patients. The greatest number of deaths were in May, June and July, and the least in December, January and February.

Meteorological Conditions affecting the General Health.—The month of April was a dry one, then came the month of May with heavy showers. In this month the number of children who suffered from diarrhœa was large. There were also a great many cases of bronchitis, especially the chronic form met with in the aged. I cannot make up my mind as to the exact cause of the increased number of cases of diarrhœa, especially amongst infants, which always occur when we have a period of drought followed by rain. It depends either upon direct pollution of the water, or, as I think is more likely, upon the amount of water actually present in the soil. The level of the underground water is constantly changing, depending upon the amount of rainfall. When the water rises it displaces the ground air; when it sinks air is sucked in again to take its place. The greater amount of space in the interstices of the soil under the surface the greater will be the amount of ground water present. The cases of diarrhœa mentioned above occurred not so much during the dry season as at the beginning of the rainy season, which leads me to believe that as the soil in this district is a very porous one, organisms present in it which thrive best during the hot season are actually washed by the rains into the rivers, the waters of which on being drunk by the children sets up a diarrhœa, sometimes of a virulent nature.

As I have said, organisms thrive best during the hot months, and are therefore most numerous in the soil at the end of the dry season. When the rains come on they are washed into the rivers, so it is not surprising to find an increase of cases of diarrhœa at the beginning of the rainy months.

Remarks on Particular Diseases occurring during the Year.—I have had one case of yellow fever in the district during the year. The patient, a lad, aged 16, became ill on February 11. I was not called in until two days later, the 13th. I had strong suspicion of the case being one of yellow fever, but was not convinced of it until I next saw him early on the following morning. The patient was then in a dwelling house in which he could not be easily isolated, so I had him removed and placed under a mosquito net. Previous to isolation the patient, after the commencement of the disease, had been moved to two different houses; these were fumigated on February 18. The last house occupied by the patient during his infective period was also fumigated as soon as he became convalescent. I asked to have my diagnosis confirmed. This was done by the Medical Officer of Kingstown District. All contacts were kept under surveillance. The whole town as well as outlying districts were thoroughly cleaned up, special attention being paid to broken bottles, empty tins, coppers, in short, all such vessels as might contain water and so allow of the breeding of the *Stegomyia fasciata*, the domestic mosquito, which transmits the disease. In all of the above-mentioned articles their larvæ were found.

St. Vincent has recently been referred to as "the Cinderella of the Windward Islands." Lately we have been making rapid progress and it behoves us to do our utmost to prevent any epidemic occurring in our midst which might cause a halt in our forward movement. I mention this in reference to the dread disease plague which has made its appearance in Trinidad, suspicious cases being reported from Grenada and Barbados. We are almost equidistant from these latter islands, so every precaution should be observed in order to prevent its entry here. A crusade has been started against the rodent rats. This is one step in preventing the *spread* of the disease, but this should be a secondary instead of a primary precaution. Prophylaxis is better than treatment, so our energies should be expended in the prevention of the *entrance* of plague, and this being accomplished there would be no necessity for the extermination of rats, which animal spreads the disease. Our quarantine regulations do to a great extent prevent the entry of infectious diseases, but in the case of plague an important factor seems to have been lost sight of, viz., the spread of the disease by the *Pulex cheopsis*—the fleas found on rats. The danger of the importation of plague from the presence of fleas in travellers' baggage is a real one and the question of efficient disinfection is not

always easy of solution; the routine procedure that passes under that name is often absolutely futile. Various powders have been reputed to be efficient insecticides; naphthaline acts well, but is too slow as it requires six and a half hours to kill fleas in a closed place and nine hours in the open. Recent experiments have been carried out in India to ascertain the effect of the light and the heat of the sun upon fleas. In previous experiments it had been found that rags spread on the ground in thin layers were freed from fleas in three hours; in the first part of the present investigation it was sought to determine the different ways in which fleas behave when clothes are spread out on different kinds of ground. Tin trays were made 4 ft. by 4½ ft. with sides 4 in. high; in these were placed *dhurries* (cotton carpets) spread over the surface and then 100 fleas were introduced, half above and half below the carpet. The tray was then placed into the sun, temperature place taken and the behaviour of the fleas carefully watched; they were seen trying to escape from the glare, but after seven minutes all were killed that were on the surface and at the end of half an hour all beneath the dhurrie were also found to be dead. When dhurries were spread on sand the effects were more marked, the sand absorbing the sun's heat faster than the tray surface; the fleas made no attempt to burrow into the sand but were almost immediately killed. When dhurries were spread on leaves and grass the fleas dived under the grass and got protection from the sun. The time of exposure necessary to destroy all fleas was reckoned to be about forty-five minutes when clothes were spread on hard ground and somewhat less on sand, the temperature being 117° F. under and 118° F. to 142° F. on the surface of the carpets. The next point was to determine how far fleas could travel on sand under these temperature conditions without being destroyed. A "flea park" was constructed of smooth soil spread over with a 3-in. layer of dry sand and enclosed in walls of tin so constructed as to form a square which could be enlarged or diminished at will. The flea-infested carpet was laid in the middle of the square. In one set of experiments the sand was kept in the shade until the commencement of the observations, and only then exposed to the sun; the distance from the carpet to which the fleas could travel was found to be 4 ft. In another set of experiments the carpet was not placed in position until the thermometers on the sand registered 120° F.; under these conditions no fleas were able to travel more than 2 ft. from the edge of the carpet; all were killed. As a result it is seen that the sun acts as a very efficient disinfectant for flea-infested clothing, simple to use and free of expense. I have myself carried out experiments to test the efficacy of the sun's rays in the destruction of fleas and have found that they possess this power to a remarkable extent. The experiments were carried out in a slightly modified manner to the above recorded. Fleas were placed in the sun in flat glass covered vessels containing sand which had been previously warmed by exposure to the sun's rays. In each case the time taken before they were killed was less than that mentioned in the experiments carried out in India. This was due to the fact that in my experiments the sun's rays travelled through glass before reaching the fleas. In order to prevent the importation of plague-infected fleas into the island I would recommend that this procedure be carried out as well as any other existing quarantine regulations. The rules drawn up are quite plain and easy of application. The ground must be fully exposed to the sun, flat, and devoid of anything that can shelter the fleas, and entirely covered with a 3-in. layer of fine sand. The surface temperature of the sand must be at least 120° F. before the clothing is spread upon it. The clothes must be spread evenly in a single layer and left for one hour in the sun, padded articles being turned once or twice; no clothes to be placed within 3 ft. of the edge of the sand. The whole area should be fenced in to keep off animals. Here we have an absolutely simple and inexpensive form of disinfection adapted to the carrier of the plague germ and applicable to all tropical countries where, as in India, there is continuous sunshine during many hours for the greater part of the year.

The general sanitary condition of this district is on the whole good, and I would suggest that in order that this might be maintained the towns and villages all over the island should be thoroughly inspected and cleaned up, say, four times a year. The truth of the sayings "Prevention is better than cure," "Prophylaxis is better than treatment," has undoubtedly been long accepted. It is impossible for individuals to realize the extent of benefits the need of which they have not felt because they have been saved from the pangs of disease; the health of the people is the supreme law not only for statesmen and law-givers but for the whole community. The common health comes before the common wealth, which indeed would be impossible of attainment without it.

The number of children who die in comparison to the number of adults is a disgrace to any civilized community. In my last report I laid great stress on the subject of infant mortality. Unfortunately there has been no betterment of the evil. Any campaign against the mortality of infants will not be successful until the social and economic conditions of the people improve. The high proportion of illegitimate births is due to unfavourable social conditions rather than to wilful disregard of virtue. The number of still-births points to the inadequacy of the attention given to women in childbirth.

The total number of vaccinations was 197. This includes those in District 5 during the last quarter.

Medical Relief:—

	Free	Payment	Paupers	Children	Aged	Police	Labourers
April ..	212	45	42	186	36	1	45
May ..	262	61	59	193	10	..	61
June ..	238	49	38	212	27	..	49
July ..	251	43	27	214	10	..	43
August ..	210	41	5	174	28	3	41
September	196	23	16	130	48	2	23
October ..	182	32	9	138	65	2	32
November	..	..	..	..	..	..	..
December	135	47	15	94	26	..	47
January ..	246	52	16	162	67	1	52
February	240	12	18	173	36	1	12
March ..	236	8	14	182	48	1	9

Once more I have the pleasure of recording the fact that there has been no case of endemic malaria in the district. On a few occasions the rivers have been converted into ponds by the formation of sand bars across their exits. This caused them to spread laterally and so make pools in which the mosquito might breed; at all such times the sand bars were promptly cleared away and so obviated any danger from that source.

CONRAD J. ARTHUR,
Medical Officer.

No. 6 DISTRICT.

The total population of the district for the year under review is, according to the census taken in April, 1911, 1,796, as follows: 1,074 in Union, 498 in Canouan, and 224 in Mayreau.

The total births for the year was 86, including 4 stillbirths, with a birth-rate per 1,000 of 40·1.

The total number of deaths was 55, with a death-rate per 1,000 of 30.

The principal diseases treated were intestinal parasites, chiefly ascarides in children, digestive troubles, and anæmia and debility.

Gastro-enteritis in children under 2 years was very commonly due to malfeeding and a superimposition of ascarides. Three cases of amœbic dysentery were met—two at Canouan and one at Union. Syphilis was met with at Canouan, chiefly in the tertiary stage. A few cases of malaria were treated at Union and one fairly severe case of bilious remittent occurred at Mayreau. All yielded readily to quinine.

Thirty-three successful vaccinations were performed by me in the district.

Sanitation is as good as can be expected. No disease could be directly traced to a want of proper sanitation.

The villages were kept fairly clean and free from bush as much as possible.

EDWIN WELLS, M.B.,
Medical Officer.

Colonial Medical Reports.—No. 49.—Shanghai.

MEDICAL REPORT, SHANGHAI, FOR THE YEAR 1911.

By ARTHUR STANLEY, M.D., B.S.Lond., D.P.H.
Health Officer.

VITAL STATISTICS.

Population.—The foreign population of the Settlement north of the Yangkingpang, including the outside roads and Pootung, at the last census taken was 13,536, and consisted of 6,293 men, 4,172 women, and 3,071 children. The foreign shipping population, which numbered 1,755, was not included. The foreign population for the middle of 1911 was calculated at 13,770. The census of the foreign population taken at each quinquennial period since 1870 shows the following expansion: 1,666, 1,673, 2,197, 3,673, 3,821, 4,684, 6,774, 11,497, 13,536.

The native population was 488,005, and consisted of 227,175 men, 129,924 women, and 130,906 children. The Chinese population was calculated at 492,000. The census of the Chinese population taken at each quinquennial period since 1870 shows roughly the following expansion: 75,000, 96,000, 108,000, 126,000, 168,000, 241,000, 345,000, 452,000, 488,000.

METEOROLOGY OF SHANGHAI.

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Year 1911
						Barometer.							
Mean inches ..	30·254	30·374	30·110	29·996	29·908	29·733	29·680	29·657	29·856	30·114	30·212	30·311	30·020
Departure from average ..	−0·066	+0·092	−0 061	−0·011	+0·036	+0·001	−0·002	−0·068	−0·051	+0·009	−0·031	+0·039	−0 009
						Temperature.							
Mean degree ..	38·75	40·39	46·58	56·55	63·86	71·31	78·62	80·47	75·65	61·66	51·67	43·02	59·04
Departure from average ..	+0·94	+1·32	+0·58	+0·43	−1·66	−2·00	−1·78	+0·21	+2·72	−1·71	−0·26	+0·96	−0·02
						Daily Range of Temperature.							
Mean degree ..	13·82	14·58	14·20	16·99	16·65	13·14	15·32	14·83	16·07	20·79	19·58	12·19	15·68
Departure from average ..	+0·45	+1·06	−0·82	+0·30	−1·16	−2·36	+0·06	−0·92	+0·39	+3·91	+1·99	−4·10	−0·100
						Degree of Humidity.							
Mean (Saturation—100) ..	78·5	77·9	83·9	80·6	83·0	89·1	85·3	87·1	96·0	77·2	78·2	82·1	83·24
Departure from average ..	−1·1	−0·7	+4·5	+0·4	+3·3	+5·1	+1·2	+2·8	+13·0	−2·6	+0·6	+6·1	+2·72
						Rainfall.							
Amount in inches ..	1·29	1·24	5·08	3·68	4·38	7·26	6·95	5·60	4·74	2·49	1·22	3·83	47·76
Departure from average ..	−0·97	−1·03	+1·58	−0 04	+0·80	+0·53	+1·45	−0·14	+0·16	−0·89	−0·61	+2·63	+0·29

The above figures have been kindly furnished for this report by Father Froc, Director of the Siccawei Obse

Deaths among the Resident Foreign Population.—During the year 1911 the total corrected number of deaths registered among foreigners, including non-Chinese Asiatics, was 270; of this number 231 occurred among the resident population.

Six months spent continuously in Shanghai is taken to constitute residence as in former reports. As the non-resident population is a variable and indeterminate factor, the deaths in this category are eliminated in the calculation of the death-rate. The death-rate per 1,000 per annum, therefore, calculated from 231 deaths occurring among the resident foreign population of 13,770, is 16·8, as against 20·2 in 1910. The deaths of 73 children (persons under 15) have been registered, as against 85 last year; of the deaths among adults, 87 were men and 71 women; of children, 41 were boys and 32 girls. The mean age at death among the adult resident population was 41·3.

Small-pox, the most obviously preventible of all diseases, levied a heavy toll among the unvaccinated.

Scarlet fever, which killed so many in 1902, still lingers among the community.

Tuberculosis heads the list of fatal diseases both among foreigners and natives, and the prevention of this disease offers a fine field for future work.

Alcohol has been responsible for the deaths of seven foreign residents during the year.

Lobar pneumonia, which nine years ago assumed almost epidemic proportions, caused four deaths.

Dysentery continues prevalent, 10 fatal cases being registered.

Beriberi is now a cause of death among foreigners on account of the increased Japanese population.

Plague-infected rats were found in diminished numbers.

Among the non-resident population the chief causes of death were tuberculosis, small-pox, typhoid fever, and dysentery.

Deaths among the Native Population.—6,799 deaths among the Chinese have been reported, compared with 8,156, 8,329, and 8,524 in the three preceding years.

The death-rate per 1,000 per annum is 138. There were 156 deaths from small-pox and 789 from tuberculosis, as against 304 and 618 respectively last year. Of the deaths, 3,790 were male and 3,009 female. The deaths of 3,009 children (persons under 15) have been registered; of these, 1,844 were boys and 1,165 girls.

Infectious Disease.

Notification.—In the absence of legal obligation to notify, an arrangement has been made between the Municipal Council and the qualified medical practitioners of Shanghai requiring notification of infectious disease for the facilitation of preventive measures, in consideration of the use of the resources of the Public Health Laboratory for the purposes of pathological diagnosis and the payment of a fee of 1 tael for each case. The notifiable diseases are: Small-pox, cholera, typhoid fever, typhus fever, diphtheria, scarlet fever, tuberculosis, plague, anthrax, glanders, leprosy, and hydrophobia. 110 taels was paid for notification fees, as against 378 taels and 385 taels in the two preceding years.

The system of notification, so far as it goes, has worked well, and the best thanks of the community are due to my colleagues in general practice for their co-operation. Chinese cases are beginning to be usefully notified by Chinese practitioners educated according to the foreign standard.

During the year 147 bills of health for ships and cargoes were issued, as against 128 in the previous year.

Weekly returns of infectious disease have been exchanged so as to get in touch with the sanitary condition of places in the Far East in communication with Shanghai.

Isolation.—Isolation for cases of infectious disease among foreigners and Chinese is provided in the Isolation Hospital, Range Road, an account of the work of which institution will be found under Hospitals.

Disinfection.—1,936 rooms were disinfected, as against 2,162 and 6,328 in the two preceding years; 80,575 articles have been disinfected by steam, compared with 107,288 and 89,346 in the two preceding years. 24,856 articles were disinfected by formalin, compared with 29,295 last year. The Disinfection Station adjoins the Isolation Hospital. Prior to disinfection each disinfector dons a sterile overall. The general method of disinfecting in a house after a case of infectious disease is firstly to remove to the station everything that can be disinfected by steam; then to spray and wash walls, floors, fittings, and furniture with disinfecting solution (cyllin). Fragile and delicate ware, such as bonnets, books, and photographs, are disinfected by formalin. In many cases, such as after typhoid fever or diphtheria, disinfection of walls, &c., is not considered always necessary, the washing with disinfectant being then limited to articles that have been actually in contact with infected material. After disinfection, painting or colour-washing of walls and ceilings is advised to be done by the occupier before the room is again occupied, without which no responsibility can be accepted by the Health Office.

Small-pox.—The incidence of small-pox was considerable at the beginning of the year. Eighteen cases were notified among the resident foreign community, of which 10 were fatal. Among the Chinese there were 156 deaths from small-pox, as compared with 304, 19, 143, and 863 during the preceding four years.

Small-pox is the typical preventible disease, and its presence or absence is an index of the hygienic education of a community. In Shanghai the Chinese are beginning to appreciate the benefits of vaccination as opposed to inoculation, which they have practised with little benefit for hundreds of years, and which is now illegal in almost all civilized countries.

Colonial Medical Reports.—No. 49.—Shanghai (*continued*).

Vaccination is done free for all Chinese and indigent foreigners applying at the Health Office. Vaccine is also supplied free to the Chinese hospitals in Shanghai. 4,933 vaccinations have been done by the Health Office during the year, as compared with 465, 380, 520, 1,418, 4,649, 3,244, and 4,608 in previous years.

There is no doubt that vaccination repeated until it no longer takes always prevents small-pox. The criterion of efficient vaccination is inability to be vaccinated. In Shanghai there exists so much small-pox infection that vaccination should be repeated every three years until it no longer takes. Where previous good vaccination is not shown by white net-like scars, aggregating at least 1 sq. in. in area, particular care should be taken to get efficiently vaccinated.

The first principles of vaccination came from the East, and thereon rests the basis of modern preventive medicine. The Chinese practised inoculation of mild small-pox as a protection against severe small-pox long before the days of Jenner. It is, therefore, probable that the Chinese will take up vaccination widely.

Cholera.—There were no cases of Asiatic cholera, while choleraic diarrhœa was not prevalent either among foreigners or Chinese. The summer was a cool one.

Attention was directed to the need of personal care in preventing the group of bowel diseases characteristic of life in Shanghai, which includes cholera and allied conditions, typhoid fever and dysentery and allied conditions. The same methods of prevention apply to all, namely, to eat and drink nothing that has not been recently boiled or cooked or otherwise sterilized.

Living in an alien country, the only sure way of securing purity of food is by sterilization. Sterilization means freeing from micro-organisms, especially the bacteria of disease. Sterilization may be accomplished best of all by heating to boiling point, as by cooking and boiling. The Berkefeld filter sterilizes water, provided the filter candle be boiled once a week at least. Canned goods, including butter, are necessarily sterilized during the process of canning, otherwise they would not keep. Bottled beverages of good reputation are practically devoid of dangerous bacteria. Ice is not sterile, and should not be put into drinks. Fresh fruit, tomatoes, melons, &c., may be effectively sterilized, without spoiling the flavour, by immersion for a few seconds in boiling water, any infection that may be present being invariably on the surface, provided the fruit be sound.

If the simple rule be observed of eating and drinking nothing that has not been recently cooked or boiled, or otherwise sterilized, it is practically impossible to contract any of those bowel troubles to which the Shanghai resident is especially prone.

Typhoid Fever.—The incidence of typhoid fever remains an important sanitary factor. The fatality of the disease, now that paratyphoid fever and Malta fever are less frequently included, more nearly approaches the true type. In nearly all cases where the origin was investigated obvious breaches of the ordinary rules of health, as laid down in the Public Health Notice, were observed.

The infection of typhoid fever may be conveyed by vegetables and oysters which have been contaminated with infected ordure, by water, by milk contaminated with infected water, through the air by means of infected dust, and directly from persons suffering from the disease or who act as "typhoid carriers" subsequent to recovery. Typhoid fever is a preventible disease, its prevention being largely a matter of individual care in the observance of the rules set forth in the Public Health Notice.

The cause of typhoid fever is practically always taken into the body with infected food, and the foods most commonly infected are vegetables, by reason of the manner in which they are grown. Especial stress should be laid on the fact that vegetables are frequently the source of infection with typhoid fever, cholera, dysentery, and other forms of diarrhœa, and particular care should be given to their thorough cooking and separation before cooking from the rest of the food. The larder or room for storing uncooked food should be separated from the pantry or serving-room where table utensils, ice-chest, bread, milk, Berkefeld filter, and cooked food are kept. There should be a washing-up sink in the serving-room so that table utensils need not be taken into the kitchen to be washed. A place in the yard outside the kitchen for the washing and preparation of vegetables prior to cooking is an additional precaution that may be recommended.

Diphtheria.—The incidence of this disease has not been marked, and the case fatality has been small. Diphtheria antitoxin is supplied free to indigent patients in Shanghai on the recommendation of the physician. In any case of suspected diphtheria antitoxin should be given at once, without waiting for the result of the bacterial diagnosis.

Scarlet Fever.—Although scarlet fever has hitherto failed to establish itself firmly in any part of Asia, excepting Asia Minor, and is practically unknown in the Tropics, it appears to have come to Shanghai to stay.

Scarlet fever was practically unknown in Shanghai prior to 1900, when it was probably introduced by foreign immigrants. As would be expected with a recently introduced disease, against which evolution has afforded no natural immunity, scarlet fever has been of a virulent type among the Chinese. It is probable that the passage of the disease through the susceptible Chinese has led to an intensification of the virus, so that it is more fatal to foreigners also.

Early notification, isolation, and disinfection are especially necesary in dealing with such a fatal and infectious disease as scarlet fever is in Shanghai. The commonest mode of infection is from a previous case, either by contact, by proximity, or by means of infected articles. The infection is given off by the breath in coughing and speaking, by the

secretions of the mouth, nose, ear and throat, and later by the peeling skin.

The incidence during the year was sporadic, and indicates need for early isolation and disinfection to prevent an epidemic recurring among the vast mass of susceptible material which exists in the Settlement.

Tuberculosis.—The prevalence of tuberculosis remains at the same high level. The lessening of the native tubercular death-rate is due rather to deaths being hidden, or intentionally returned from other causes, as a result of disinfection being carried out, than to any marked sanitary amelioration in respect to the disease. Something has been done by widely distributing the Tuberculosis Prevention Notice, by the fugleman reciting the same to crowds gathered by a bell, and by careful investigation of all cases notified so as to ensure disinfection of the infected spit.

The enormous death-rate is significant of local conditions of overcrowding, against which there is at present no legislation. The prevalence of tuberculosis bears little relation to climate, but is common wherever man closely aggregates. Indiscriminate spitting and deficient air space are the chief causes of consumption. The spit of consumptives being infectious should only be received into receptacles which can be burnt or boiled, or the contents destroyed by strong antiseptics, fire, or boiling water. It is probable that most cases of tuberculosis of the lungs are contracted by breathing the infected droplets ejected by infected persons during coughing, sneezing, and speaking.

Plague.—Plague-infected rats were found in December, 1908. A complete plague survey of the Settlement has been maintained since. During 1911, 14,929 rats were found dead and brought to the Laboratory for examination, and of these 138 were plague-infected, compared with 19,559 and 249 respectively during 1910. During the year nearly 177,040 rats were trapped and burnt. These, with the rats found dead and examined for plague, brought the total number of rats visibly accounted for to 191,969. In addition to the trapping, close on 6,000,000 phosphorus baits were laid, about a ton of poison being used, which proved a powerful method in dealing rapidly with infected foci. Poisoning on so large a scale carried with it certain risks, but, since using poisoned cubes coloured bright blue instead of the usual method of spreading the poison on bread, no cases of adventitious poisoning have been reported. 11,653 houses, not keeping cats, in plague foci were temporarily rat-proofed and pulicidally disinfected; bedding, &c., being passed through the steam disinfector. This temporary rat-proofing included the plastering up of rat holes, bricking up and wire-netting places permitting ingress of rats into houses; the furniture of the house being removed to permit of thorough examination for rat holes and runs.

As regards the distribution of plague infection among rats, the infection has been concentrated in the Northern District, especially near the boundary of the Settlement where it abuts on the beggar settlement of Chapei, which is outside municipal control and very insanitary. In the Eastern District, where the rat infection was most intense soon after the discovery of plague-infected rats in December, 1908, the measures adopted have exterminated infection, no plague-infected rats having been found since May, 1910; and the Central District also shows a great improvement on last year's figures; while the Western District has never shown any marked infection, and it would appear as if the infected rats found had come over from the Northern District and Chapei. These observations tend to show it is to the introduction of plague-infected rats from the Chapei beggar settlement, where practically no sanitary measures have been taken by the native authorities, that the intensity of the infection of this part of the Settlement is due. This and the subsequent occurrence of human plague cases in Chapei show how dangerous such a neighbourhood on the boundary is to the sanitary well-being of the Settlement.

A case of bubonic plague, the diagnosis of which was confirmed in the Laboratory, was notified on May 25 by the medical staff of the Chinese Public Hospital in the Soong-ching-li, Haining Road. The place of origin, however, was found to be Chapei, in a house where two dead rats were noticed in Tien-pao-li, from which the family removed to the house within the Settlement on May 15. Two children of the patient had died, having enlarged neck glands, presumably caused by plague. The first child died the day after the family moved into the Settlement from Chapei. The family was Cantonese and, suspecting plague, communicated with the Chinese Public Hospital, who isolated the case and co-operated with the Health Office for preventive purposes. The arrangement previously made was put into operation immediately, namely, measures relating to the person, such as medical examination, isolation, and treatment, were carried out by the Chinese staff of the Chinese Public Hospital, while measures relating to the dwelling and its surroundings were carried out by the Health Office, such as collection of rats found dead and examination for plague in the Laboratory, rat destruction by trapping and poisoning, rat-proofing of houses, depriving rats of means of sustenance, disinfection, &c. A house-to-house inspection was made in the neighbourhood and the sanitary staff concentrated for other plague-preventive purposes.

This occurrence clearly showed the great danger this Settlement runs through having a neglected pest spot just beyond its borders. As anticipated, plague again broke out in Chapei two months later and with increased virulence. Between July 22 and August 23 upwards of thirty cases of bubonic plague were reported, twenty-six of which came under the direct notice of the medical inspectors of the Chinese Public Hospital. The area within which these cases were discovered was just beyond the Settlement boundary, an area holding some 10,000 people.

In anticipation of danger a barrier of rat-proofed houses about 250 ft. wide had, when the Chapei plague outbreak began, already been formed be-

tween the plague-infected spot and the rest of the Settlement. The work of extending this barrier was pushed forward rapidly, so that by the end of the year 2,433 houses had been permanently rat-proofed in this neighbourhood at a cost of a little under $15 a house. As a result rats have diminished so that it has been possible to reduce the plague-prevention staff in places where the houses have been rat-proofed, while the salient point may be noted that the sharp outbreak of plague in Chapei did not take hold within Settlement limits.

Notwithstanding this barrier of rat-proof houses, it was considered advisable to erect also a rat-proof curr ugated iron barricade along the Settlement boundary line, provided with rat-proof gates to permit traffic and to be guarded at night, for the purpose of more effectually cutting off infection by rats from the plague-infected area in Chapei just beyond the Settlement boundary.

Another plague-preventive measure of considerable permanent value has been the erection of rat-proof house refuse receptacles on Chinese property. A marked improvement in the cleanliness of alleys has resulted. It will be apparent that rats will thus be deprived of a vast store of nourishment, and, as the rat population is to a large extent regulated by the amount of the available food supply, this is held to be a radical plague-preventive measure.

Although the initial cost of permanent rat-proofing is comparatively large, yet, if adequate building rules are promulgated and new houses built in accordance with the requirements of modern sanitation, not only will it be possible to gradually reduce to extinction the present large plague-prevention staff, but this measure of permanently rat-proofing houses forms the greatest insurance against plague in the future and is, in fact, the only permanent safeguard. A house permanently rat-proofed is not only a healthier one to live in, but is an almost certain guarantee against bubonic plague to the inmates.

Of the rats examined in the Laboratory, about 70 per cent. were *Mus rattus* and the remainder *Mus decumanus*—*rattus* being the black or ship rat, which usually lives in houses; and *decumanus*, the brown or sewer rat. *Mus rattus* largely preponderated among those plague-infected. Of the fleas, *Pulex cheopis* and *Ceratophyllus fasciatus* have been identified, the former being the flea usually associated with the spread of plague from rat to man.

In formulating anti-plague measures the rat has been the chief objective, as it is held that the rat is the essential cause of epidemics, the flea being the carrier of infection from rat to rat and from rat to man, infection from human cases, which is practically limited to the few pneumonic cases which usually arise, being comparatively rare. The dictum "No rats: no plague" has been taken as a working basis, and a house that is rat-proof has been considered for all practical purposes plague-proof.

Malaria.—Quite a number of cases of malaria fever, mostly of the benign tertian type, are contracted in and around Shanghai.

Periodic examination has been made of mosquitoes collected from each of the sanitary districts into which the Settlement is divided, and the following have been found: *Anopheles sinensis* (malaria bearing), *Stegomyia scutellaris* (yellow fever bearing), *Culex fatigans* (the host of filaria), and *Armigeres ventralis.*

The prophylaxis of malaria resolves itself into: (1) Suppression of mosquitoes, (2) prevention of infection of man by mosquitoes, (3) prevention of infection of mosquitoes by man.

Every effort should be made by householders to do away with all receptacles of stagnant water, where mosquitoes breed, such as ponds, water-plants, drains out of repair, abandoned tubs, pots, tins, and what not. The mosquito net should be assiduously used wherever there are mosquitoes, and especially in up-country houseboat trips. It is doubly necessary to surround a person suffering from malaria with mosquito netting to prevent mosquitoes being infected and acting as carriers of infection.

Beriberi.—The incidence of beriberi among the municipal prisoners has diminished. The cause of this disease remains under close observation, though up to the present wrapped in obscurity. The evidence preponderates in favour of the disease being an infective one, having no direct relation to food, but infective through body vermin.

Dysentery, with liver abscess as a not infrequent sequel, continued prevalent.

Rabies.—Eight persons were bitten by rabid dogs within the Settlement during the year and subsequently underwent the Pasteur treatment. The virus of rabies in Shanghai dogs is of an exceptionally intense character, the period of incubation being shorter than the rabies met with in dogs in Europe.

Leprosy is a disease which so seldom concerns foreigners in Shanghai that its study is somewhat neglected. Cases are met with occasionally, though it seldom figures in the death statistics of either foreigners or Chinese. There appears to be no urgent call for special preventive measures.

Dengue.—From its home in the Malay Archipelago, dengue has frequently during recent years spread up the coast ports to Shanghai. It very rarely kills, but frequently incapacitates from work a large section of the community. It is an intensely infectious disease, spreading in mass like influenza, but appears not to be spread by contagion.

Relapsing fever again made its appearance among municipal prisoners. The examination in the laboratory of the blood from certain fever cases has shown that relapsing fever is probably quite common among the Chinese population and occurs also to some extent among foreigners. This fever is much more prevalent in Shanghai than has hitherto been thought, a circumstance which may help in the future to clear up certain obscure cases of fever.

It is probable that infection is determined by the presence of body vermin, and measures which ensure their destruction will prevent the disease spreading.

Cattle plague severely affected the dairies in the Eastern District during the year. The mode of incidence appears to show that its origin is not in food,

nor is the infection carried by the coolies, but that insects are the probable means of spread. Immunization by Koch's gall method was offered to all the Chinese dairies, but almost invariably refused. The ordinary preventive measures of isolating sick animals and thorough disinfection were carried out so far as possible.

Koch's gall immunizing material is prepared as follows: An animal dying of cattle plague, the belly is opened and the diagnosis confirmed by finding the pyloric region, both of the stomach and bowel, congested and eroded. The gall-bladder is then seized around the neck and excised by cutting into the liver substance. The cut surface of the bile duct is sterilized by washing with cyllin, 1 in 50, and the gall jetted into a sterile, wide-mouthed bottle. The gall should be clean and green, and, if thick and red, should, unless very carefully glycerinated, be rejected. An equal quantity of glycerine is then thoroughly mixed with the gall, which, after repeated shaking, is ready for use after seven days. Koch, the originator of the method, found (and it has been subsequently observed by other workers) that fresh gall or glycerinated gall kept less than four days may sometimes convey infection. The use of glycerine with the gall, however, completely removes this disability within a few days and renders its use absolutely safe. This method has been used for immunizing over 300 dairy cattle in Shanghai with no untoward result. The immunity, however, does not last long, so that the injection of Koch's glycerinated cattle-plague gall should be repeated every three months. It is held that, were all the dairy cattle four times yearly thus injected, cattle plague would run a very poor chance of spreading.

Kölle and Turner's simultaneous method of immunization by virulent cattle-plague blood and immune serum can be recommended as producing a greater degree of immunity than the gall method, but its application is more difficult and there may be some slight loss of cattle as a direct result. There can be no doubt that were dairymen to have their cattle thus immunized they would be saved great subsequent financial loss from epizootics of cattle plague.

Public Health Laboratory.

Inasmuch as the study of the life-history of pathogenic organisms must precede all adequate measures for preventing the diseases which they cause, no pains have been spared to develop the resources of the Municipal Laboratory. It is the centre of work of the Health Department. Its purposes have been the investigation of diseases met with in Shanghai, the diagnosis of infective disease, the preparation of preventive and curative remedies against these diseases, and the analysis of products bearing on the public health. The matters which have been under investigation have been the causes of variation in virulence of small-pox vaccine, cholera antitoxic serum, the natural filtration of water through alluvium, the suitability of fruits and vegetables as media for the growth of certain pathogenic organisms, preventive inoculation against cattle plague, the causation of beriberi, the incubation period of the rabies in China, the prevalence of Malta fever, and the natural disposal of organic matter in house-refuse.

Antitoxins.—On account of the overcrowded state of the Laboratory, which requires enlargement, it has been found advisable to cease the production of diphtheria and other antitoxins and to import from home. A stock of these products is, however, kept ready for local use.

Anti-rabic Treatment of Pasteur.—Since the opening of the Shanghai Pasteur Institute in 1899, 327 persons have received the treatment. During the past year 25 persons were treated, in 14 of whom the animals responsible were proved rabid by inoculation. Eight of the cases were the result of dog bites within the Settlement.

Fifty-nine dogs were admitted to the observation kennels, 7 of which proved rabid. Twenty-three animals suspected of rabies were examined in the Laboratory, and of these 17 were proved rabid by inoculation.

The incubation period of rabies in rabbits inoculated with the brain of dogs sent to the Laboratory for examination averaged fourteen days.

Hospitals.

The municipal hospital system has been concentrated in the vicinity of the Isolation Hospital and Nursing Home so as to facilitate supervision by the Assistant Health Officer in charge and to co-ordinate this part of the work of the Health Department.

In order to provide for adequate training of native nurses for the Chinese hospitals under the Department the learning of Chinese has been encouraged, and there are now five nurses studying the language with this object.

Isolation for cases of infectious disease is provided at the Isolation Hospital, Range Road. There is a separate hospital for Chinese cases. Admission to either hospital is voluntary, and the institutions are for the benefit not only of the patients admitted but of the community. Every endeavour is made to make the hospital as comfortable as possible and the surroundings pleasant, while the fees are arranged so that in no case may the question of payment of fees prevent anyone from coming into the hospital. The fees for admission to the foreign hospital are 6 taels a day for private rooms, and 2 taels a day for wards wherein free beds are available for poor people. Wherever possible the patients or their friends arrange for medical attendance. Admission to the Chinese hospital is free, but a small charge is made for private rooms. In the Chinese hospital patients may be attended by their own native doctors if they so desire. Considerable improvement is expected to result from the organization of the nursing of Chinese by Chinese under the supervision of the matron.

Colonial Medical Reports.—No. 49.—Shanghai *(continued)*.

Ambulances are provided for the conveyance of patients suffering from infectious disease to the Isolation Hospital. Other vehicles used for conveyance of cases of infectious disease to the hospital are detained at the hospital until disinfected.

More accommodation is needed for cases among foreigners of minor infectious diseases, such as measles, chicken-pox, mumps, and erysipelas, and for observation of cases before diagnosis is confirmed. Should there be an outbreak of plague, when both small-pox and scarlet fever were prevalent, the accommodation at present provided would be inadequate. Isolated accommodation is also required for cases of tuberculosis among foreigners, for which there is at present no adequate provision in the Settlement. Were this provided on the Isolation Hospital site and worked in combination with a branch of the Municipal Sanatorium at Mokanshan, benefit would accrue both as regards the prevention and treatment of this disease. At present, if a case of consumption occurs in a family which cannot afford to send the patient away to a proper European or American sanatorium, he often has to remain at home, becomes a source of infection to those with whom he comes in contact, and lives under conditions which render small the chance of cure. On the other hand, were there adequate accommodation for isolation and treatment it would then be possible to remove the patient to hospital, where the hygienic conditions would tend towards cure, and a dangerous source of infection would be removed from the patient's own home. There is also need for dispensaries in different parts of the Settlement for the treatment and education in the means of prevention of Chinese cases of tuberculosis, for a hospital for advanced cases, and for a sanatorium for the treatment and isolation of curable cases.

Victoria Nursing Home.—The new kitchen block was organized during the year, a resident housekeeper being appointed, whose sole duty it is to supervise the cooking and service of food. Considerable improvement has resulted. The object aimed at is to have the food and service the best that can be got. The hot water supply has been increased.

Mental Wards.—The mental wards adequately fulfil their present function. Thirty-three cases were received during the year. Admission is procured by the signature on Form A or Form B obtainable from the matron. Form A requires the signature of the person immediately responsible for patient, who undertakes responsibility for payment of fees, provision of medical attendance, for procuring any order that may be required by the law of the country to whom the patient belongs, and for removal of patient after six months if still remaining in the wards. Form B is used when no one immediately responsible is forthcoming, the responsibility then naturally devolving upon the Consul of the nationality of the patient. There still remain cases where a Consul will not assume responsibility, and it remains to make some sort of humane provision for these cases to prevent them from becoming a nuisance or a danger both to the public and themselves, and at the same time to keep the mental wards from being filled with chronic lunatics, for which class of case they were never intended.

Police Hospitals.

Indian Police.—The health of the Indian police shows a progressive movement. The average number of days off duty sick was 6·5 days per man, as against eight and seven days in the two preceding years. Tuberculosis of the lungs was again the chief cause of invaliding out of the service. Some improvement has been effected in the general cleanliness and ventilation of quarters. Intestinal troubles have slightly diminished owing to better supervision of kitchen arrangements. Venereal disease shows a small increase. Gin drinking has led to serious ill-health.

Chinese Police.—Ten men were invalided on account of tuberculosis, all except one living in their own homes. Beriberi broke out among he men at the Gordon Road Depôt, which was found bug infested, as on a similar occasion last year. Disinfestation was carried out and a vermin-proof construction recommended, after which no further cases arose. Cases of relapsing fever occurred among men living in their own homes. Twelve cases of benign tertian malaria were diagnosed by laboratory examination. Infectious diseases of the skin and eyes, and venereal diseases, were very prevalent.

Chinese Prisoners.—Weekly inspections of the prisoners in the cells at the various police stations have been made, and, as far as accommodation would allow, all cases of skin and venereal diseases, which are very common, sent for treatment to the police and isolation hospitals, resulting in considerable improvement in the condition of prisoners admitted subsequently to the gaol. All except one of the cases of relapsing fever were admitted to the cells in the incubation period. The spread of the disease was prevented by thorough disinfestation from body vermin, isolation of cases, and segregation for fourteen days of contacts. There were four cases of benign tertian malaria and one of the malignant type. Thirteen major operations were done, including five for radical cure of hernia and two laparotomies.

Gaol.—There has been a steady improvement in the health of the gaol. Tuberculosis was again the main cause of death, most of the cases having signs of the disease on admission.

The incidence of beriberi has still further decreased. Since 1899 the number of cases of beriberi among prisoners in the gaol in succeeding years was as follows, namely: 27, 34, 134, 0, 0, 2, 2, 2, 1, 5, 78, 16, and 7. From 1899 to 1901 the ordinary sanitary measures of isolation and disinfection were carefully carried out without success, no special measures against infestation with body vermin being

taken. The new gaol, presumably vermin free, was then occupied, and at first no cases of beriberi occurred, in marked contrast to the severe infection in the old gaol. From 1904 till 1909 the cases of beriberi gradually increased, reaching a maximum in 1909, when the gaol was found infested throughout with bugs. During the last two years measures were taken to exterminate bugs which, though not entirely successful, are held responsible for the reduction in the number of cases of beriberi. The diet during the whole of this period was substantially the same. It is proposed to make one block at the gaol vermin-proof by making the walls smooth, replacing the wooden skirting boards by cement, and by caulking and varnishing the upper and lower surface of the floors, so as to get rid of all cracks and crannies which might harbour vermin.

An admission block has been erected during the year which provides facilities for the proper physical examination of prisoners on admission, so as to secure the general mass of prisoners against infection from outside.

Sanatorium.

Since the opening of the Municipal Sanatorium in 1907 the number of visitors has increased each year. Some of these were convalescent after illness, and others so run down in health that sanatorium treatment was advisable in the interests of the service. The general consensus of opinion among the visitors was satisfactory as regards benefit to health and enjoyment, and confirmed the opinion held that Mokanshan is the best available place for a municipal sanatorium for Shanghai.

SANITARY INSPECTION.

The foreign Sanitary Inspection Staff is now composed of four inspectors and twenty-two assistant inspectors. The inspectors possess both the Sanitary Inspector's and the Food Inspector's certificates of the Royal Sanitary Institute, while six of the assistant inspectors possess the Sanitary Inspector's Certificate of the Royal Sanitary Institute. By means of a system, inaugurated four years ago, of examinations in sanitary knowledge as applicable locally, divided into three stages each carrying extra pay, health inspectors, recruited locally, are being trained to a high state of efficiency.

Sub-district records have been prepared which give in fullest detail all the information regarding the locality required by the sub-inspector for the performance of his duties. These records are added to as new circumstances arise, and make it possible quickly to hand over a sub-district without dislocation of work.

Sub-district Offices.—The institution of subsidiary health offices in each of the seventeen sub-districts into which the Settlement is divided for sanitary purposes has been developed during the year. Chinese houses have been rented and turned into pretty good local centres for sanitary work. The practical sanitary work has been decentralized. Each sub-district office controls the sanitation of the sub-district in which it is situate, an area containing some 30,000 inhabitants, or 3,000 houses.

Public Health Notices.—The circulation of Public Health Notices in Chinese has been found to be a good way of propagating sanitary knowledge. Each district has its fugleman, whose duty it is to collect crowds round him by means of a bell in the alleys and tea-houses, to whom he recites the notice appropriate to the occasion. A translation of such parts of the Annual Report as concern the native population has been made and distributed. A translation into Chinese of the plague number of the *Municipal Gazette* has been made. A translation of the Public Health Notices into Japanese has also been made for the benefit of the Japanese community.

Lectures.—A Chinese of the more educated class is employed to lecture on health matters once weekly at each sub-district office. The subjects taken are those appropriate to the season, such as the notices dealing with vaccination and small-pox, plague prevention by rat-proofing houses and rat destruction, tuberculosis, cholera, mosquito extermination, general preventive measures, together with extracts from the Chinese edition of the Annual Health Report.

Chinese Dwellings.—The finding of plague-infected rats brings up acutely the question of the insanitary condition of houses built according to the Chinese Building Rules, against which protest was made at the time the rules were made and frequently repeated since. It is held that a house which provides places where rats may obtain seclusion is, on account of the special danger which the Settlement runs from plague, insanitary. At present the space left between the floor-boards and the ground becomes a receptacle for any filth that finds its way between the floor-boards and provides a home for rats and enables them to make an entry into any other parts of the house which are hollow, such as the space between the ceiling and the first floor and into the roof space and among the tiles, in all of which places rats may find seclusion.

Amendments of the Chinese Building Rules, having for their object the exclusion of rats, were approved and published on March 30, and came into force six months later. These amendments provided for a solid ground floor, and prohibited hollow lath and plaster walls and partitions. The question of prohibiting ceilings, the importance of which had been frequently pointed out, was allowed to lapse temporarily in deference to the wishes of property owners, pending the proof that the removal of ceilings in the majority of houses will not appreciably affect the comfort of the tenants or lower rents. As a result of the rat-proofing work, carried out chiefly in the plague-infected Northern district during the latter half of the present year, close on 5,000 houses now have solid ground floors, and either have had all ceilings removed or were without ceilings to begin with, as is practically universal throughout the rest of China. In no case have tenants vacated

their houses as a result of these rat-proofing operations.

Foreign Dwellings.—The attention of architects is called to the Public Health Notice wherein it is suggested that every house should, if possible, have a serving-room adjoining the dining-room and separate from the kitchen. The serving-room should be fitted with a washing-up sink, Berkefeld filter, shelves for all the table utensils, groceries, &c., and room for the ice-chest. It is held that the separation of the serving-room from the kitchen is an important means of preventing those food infections which are so prevalent in Shanghai, and which are brought into a house chiefly by infected vegetables. Cooking destroys the infective material, so that food that leaves the kitchen should reach the table without contamination. This can be ensured by having table utensils kept in, and the service of food done from, a serving-room kept quite separate from the kitchen. The serving-room should be rather a part of the dining-room than of the kitchen. As an additional safeguard, a place for the washing and preparation of vegetables prior to cooking may be provided in the yard outside the kitchen. A great number of foreign houses lack a proper serving-room, and use the space under the staircase for that important purpose. This space is usually too small, dark, and ill-ventilated, and is often without a washing-up sink. The wooden zinc-lined sinks are frequently abominable, and glazed earthenware sinks with proper waste pipes of lead should replace them.

Many foreign houses are infested with rats and, should plague become prevalent, may become a source of great danger. In these houses the gratings under the ground floor are generally found loose or broken so that the interior of the house is easily accessible to rats, which then make use of all the hollow spaces which ceilings and lath and plaster partitions provide. It is advisable to have the ground floor as far as possible solid. The floor of the kitchen, larder, and outhouses should be solid and of cement if possible. Lath and plaster partitions are better avoided, but if used may be made fairly rat-proof by being made solid for about a foot from the floor, as rats generally obtain access by gnawing through near the floor level. The reinforced concrete method of construction is well suited to local conditions in view of the need of rat-proofing buildings.

Those about to rent houses are advised to ask the health officer for a sanitary inspection and a certificate of good sanitation before closing with the landlord.

House Refuse.—The disposal of house refuse is beset with difficulties, but they have been satisfactorily met. "Country boats" have been encouraged to come to the shoots and remove house refuse for agricultural purposes, and of the total quantity brought to the shoots well over half has been disposed of in this way, and nearly a fifth used for filling and raising purposes.

Observations extending over ten years on the natural disposal of organic matter in house refuse, with frequent inspection of the garbage heaps, tend to show that within a year and a half all the decomposable organic refuse disappears by oxidation, which is tantamount to slow combustion—the heat generated spontaneously in a garbage heap being very considerable—and leaves an innocuous mass, without smell, which forms a suitable material for filling in low-lying ground and shallow stagnant pools. It is not necessary to go so far as to recommend its use for raising building sites to be used within five years, but it would be excellent material for raising garden sites and for filling the holes left near houses by the excavation of mud if not below the ground water level. In the large garbage heaps at the depôt the nuisance from smell and flies disappears after three months; and in properly conducted filling-in operations it is possible by covering recent house refuse with a layer of clean earth to remove nuisance from these causes and at the same time promote oxidation and destruction of the objectionable organic matter. It is hoped, therefore, that anyone desiring such filling-in operations will communicate with the health officer. In this way it is hoped to avoid to some extent the further objectionable accumulation along the banks of the creek and the dumping of garbage into the waterways, which is difficult to entirely prevent. When it is remembered that every stagnant pool means mosquitoes, which are the potential cause of malaria, it is held that any temporary nuisance that may occur during the course of filling-in is outweighed by the sanitary advantages which subsequently accrue. This method, therefore, is advisable both from the point of view of economy and sanitation. Unfortunately, distance prevents the use of this method for the refuse from the crowded districts of the centre of the Settlement.

As it is becoming more and more difficult to rent suitable dumping places for house refuse, one or more sites are being acquired to provide permanent depôts so near the centre of the Settlement as will afford easy access for inspection with the object of preventing dumping in the water, to enable boats to return to their shoots by the following morning, and to facilitate disposal of the material within the Settlement for raising and filling-in purposes. In this way it is hoped that the whole of the house refuse of the Settlement will be disposed of in an efficient and sanitary manner, giving rise to no permanent heaps and banishing, as far as possible, dumping in the creeks.

House Refuse Receptacles.—Primarily as a plague preventive measure, in order to limit the food supply of rats, 2,523 house refuse receptacles of rat- and fly-proof construction have been erected during the year throughout the Settlement. After years of experiment, the form of receptacle now erected appears to fulfil its object best. The Chinese like them, and mostly use them instead of throwing their garbage outside their doors, so that in all save the worst neighbourhoods a marked improvement in the cleanliness of alleys is found.

It is apparent that rats will thus be deprived of a vast store of nourishment, and as the rat population is to a large extent regulated by the amount of the available food supply, this is held to be a radical plague preventive measure. The approved form of receptacle is made of brick and cement or of cement concrete, is 3 ft. long by 2 ft. deep, with a sloping top having a small iron slam door which cannot be opened beyond the vertical, and so automatically shuts itself after house refuse has been emptied in, and having an iron door at the side with a special fastening of which the house refuse removal coolie only has the key, and through which the refuse is daily removed.

Drainage and Paving.—It has been considered a duty in the ordinary course of sanitary inspection, not only to point out sanitary defects, but also to provide the means whereby these defects can be best remedied and to supervise the work to completion.

The defect usually met with in the course of inspection is that of blocked surface drains due to absence of proper surface inlets. The use of gully traps with hinged grids with lineal openings is desirable, instead of the small circular openings at present so frequently used. Although the standard of drainage is improved, much is still required before the materials used are laid so as to obtain maximum self-cleansing and ability to stand the test of hard wear and tear.

Creeks.—Regarding these important natural tide-flushed drains, the object has been the abolition of stagnant water and the maintenance of tidal channels open, clean, and clear. The flatness of the Settlement necessitates the maintenance of certain waterways, and the Yangkingpang and Defence Creek, if properly maintained, are among them. The maintenance of the main artery creeks so as to permit of daily tidal flushing is a vital necessity.

Mosquito Extermination.—A special staff was organized which worked from the beginning of April until the middle of October. The results are considered satisfactory, a diminution in the number of mosquitoes, estimated at from 25 to 75 per cent., having been effected. The work of the Chinese staff required very careful foreign supervision, as the results of good work were not directly apparent, and the detection of bad work required assiduous care on the part of the foreign inspector.

Co-operation was obtained from most foreigners, but the majority of Chinese showed a complete indifference, amounting occasionally to active opposition. No prosecutions were undertaken to enforce these mosquito extermination measures, but this would appear desirable in flagrant cases after repeated warning.

A good class of coolie was obtained, and heavy fines inflicted on finding mosquito larvæ in places recently worked through. The coolies worked in couples in an area exactly delimited. Each area was further subdivided into seven for each day in the week and a time-table kept, so that it could be known exactly where each mosquito couple was working at any time. The assistant inspector accompanied and gave detailed instructions to each pair of coolies early in the season, and made written notes of those unusual places where stagnant water was likely to be found, such as native gardens, empty houses, defective paving, gullies in unfrequented places, &c., *i.e.*, those places which were likely to be beyond a coolie's intelligence to think of or beyond his courage to enter; these places subsequently received the special attention of the assistant inspector. Practical roadside demonstrations were given of the way mosquitoes develop, and how to prevent them developing by getting rid of all collections of stagnant water.

The thicker oils, containing a large proportion of crude petroleum, were not found to form good spreading films even in the hottest weather—equal parts of kerosene and crude oil was found of most value.

Flies.—Against what has been truly described as "the deadly house fly," the careful collection and disposal of house refuse is a measure of primary importance. Among other public measures has been the requirement as one of the conditions of licence, in premises licensed for the purpose of safeguarding the food supply, of adequate means being taken to prevent the access of flies to foodstuffs by the use of perforated zinc in windows and spring doors. This screening against flies is also an important individual measure, and should be applied to the serving-room, kitchen, and servants' latrine; while cleanliness should be maintained in and about the house, so as to deprive the insect of food and of breeding-places. The provision of 2,523 fly-proof cement and iron refuse receptacles throughout the Settlement had for one of its objects the diminution of flies.

Laundries.—All the laundries within the Settlement are licensed and regularly inspected. The system of sanitary control has been one of frequent inspection, so as to make the licensees reluctant to transgress the terms of their licences, rather than one having for its object a large number of prosecutions. It should be noted that the coolies carrying washing to and from the licensed laundries are provided with municipal distributing tickets, so that residents can easily identify the licensed laundries. It is advisable to insist on seeing this ticket from time to time, as there are several insanitary laundries outside the Settlement, especially in Pootung, which it is impossible to license. If the public, including the shipping community, were not to patronize these insanitary laundries they would soon cease to exist.

The native lodging-houses and hotels have been regularly inspected, and those of the lower class periodically disinfected and permanently rat-proofed.

During the year all the premises licensed for public health purposes have been lime-washed, and cleansing operations of the nature of disinfection have been carried out in insanitary property in many parts of the Settlement.

Colonial Medical Reports.—No. 49.—Shanghai (*continued*).

Insanitary Areas.—The northern and western limits of the Northern District abut on a most insanitary neighbourhood, wherein dwell an increasing population composed chiefly of beggars and other undesirables living under such unhealthy conditions as to be a serious menace to the health of the Settlement. With plague threatening the Settlement, the need for extension for the purposes of sanitary safety is more urgent than ever, as the preponderance of plague-infected rats in this locality and the resulting occurrence of human cases of plague are attributable to the continual introduction of rats from the Chapei district, owing to the absence of the necessary sanitary measures. A clear interval of at least a mile should be left between the thickly populated parts of the Settlement and the boundary.

Public Latrines and Urinals.—The practice of coating urinals with crude petroleum has greatly improved their condition, preventing deposit in a remarkable manner. In order to prevent disease carried by flies from infected fæces the fly-proofing of latrines was undertaken, but not altogether with success through wanton destruction and theft of the material used.

Ordure Removal.—The removal of ordure continues to be efficiently done, and is a source of considerable profit to the community. There is a ready demand throughout the year for use in growing such crops as indigo, and were it not for its employment also in growing market produce for the table, which it is practically impossible to prevent, the method of disposal is more sanitary than any other, and, as regards the economy of nature, nearly perfect.

Arrangements are being made for the licensing and inspection of premises for the storage of dangerous materials, namely, those which, on account of fire or explosion, may endanger life or property, such as gunpowder and similar nitrate mixtures, dynamite, blasting gelatine, carbonate, nitro-cotton, smokeless powder, picric acid and similar nitro-compounds, chlorate mixtures, fulminates, fireworks, ammunition, benzene, and other very volatile and inflammable coal tar products, petrol, gasolene and other very volatile and inflammable petroleum products, acetylene, calcium carbide, yellow phosphorus, or any material containing any of these as an ingredient in dangerous quantity.

The public swimming bath was open from May 1 to October 31. The number of persons admitted was rather less than in the three preceding years. The smaller number appears to have been due to the unusually cool weather and to the lessened number of spectacular events; the actual number of swimmers having, if anything, increased in number. The condition of the water was regularly and carefully tested, and, by the use of one part in a million of copper sulphate at each filling, a high degree of purity was maintained, and the "sore ears," so frequent an occurrence in local swimming baths, was not heard of.

Food.—As the preventible diseases specially prevalent in Shanghai are mostly caused by infected food, food inspection has been considered of paramount importance.

The foreign food supply is under complete sanitary supervision, and the same is gradually being done for the Chinese, premises being licensed as soon as the necessary conditions have been met.

The periodic analyses of water supply by the Shanghai Waterworks Co. show that filtration is carefully done. The bacterial content has only occasionally been above 100 per cubic centimetre.

There has been a progressive improvement in the quality of milk supplied. The standard of cleanliness in dairies has been maintained. The windows of the milk rooms are now required to be unopenable, and provided with perforated zinc instead of glass, and the door with a spring slam to prevent ingress of flies. The extreme step of withdrawal of the licence was taken in the case of Yak Kyi Dairy during the year on account of ineradicable adulteration of milk after repeated prosecutions. As regards punishment for adulteration, it has been found that fining is the least effective, while imprisonment and the cangue have a marked deterrent effect.

The licensed butchers, poultry, game, and vegetable shops have been kept in good sanitary condition. Arrangements have been made for the licensing of bakeries, fruit, vegetable, fish, and other foodstuff shops, ice-houses, and aerated water factories under powers conferred by the by-laws.

Twenty thousand eight hundred and ninety-two pounds of unsound fruit, vegetables, &c., were seized. The native ice-cream and cool-drink dealers have received the attention of the inspectors.

The examination of cattle and carcases at the Municipal Slaughter House affords adequate protection of the meat supply.

Good meat is stamped with a circular stamp for beef and a triangular stamp for mutton, pork, and veal, with the words "KILLED MUNICIPAL SLAUGHTER HOUSE" and the date of slaughter. Meat inferior in quality, but free from disease, passed for sale on stalls only, is marked "SECOND QUALITY." No meat for foreign consumption is allowed to be sold from any shop or brought into the Settlement unless it bears a municipal stamp.

The pig slaughtery was handed over to the pig killers at the end of February in return for payment of the cost of installation. Since turning the concern over it has been well conducted.

A small market is required for Lower Yangtsepoo. Efforts have been made to get all street hawkers of foodstuffs into the market with varying success in the absence of police compulsion day and night. It is proposed to permit street hawking under licence, provided the hawkers are equipped with fly-proof baskets.

Colonial Medical Reports.—No. 50.—British Guiana.

MEDICAL REPORT FOR THE YEAR 1911–1912.

By J. E. GODFREY.

Surgeon-General.

Public Medical Institutions.

Public Hospital, Georgetown.

This institution has accommodation for 291 males and 245 females; 11,149 patients were admitted during the year, and with the 496 patients remaining in hospital on April 1, 1911, make a total of 11,645 patients treated. The number of out-patients treated was 44,958, an increase of 3,050 on the previous year. There were 1,265 deaths. This gives a death-rate of 10·8 per cent. of the total number treated. Of the total deaths 284, or 22·4 per cent., died within twenty-four hours, and no fewer than 511, or 40 per cent., died within seventy-two hours of admission.

Every year the Resident Surgeon draws attention to the large number admitted in a dying condition.

This year he reports: "The death-rate of those who come to hospital too late for all human aid is still high; a large number of our deaths would have had a far better chance had they come earlier, and had the advantage of good nursing."

He also refers especially to the high death-rate from pneumonia due to the delay in coming to hospital and says: "The sick people do not realize the importance of early hospital treatment, although we are continually pointing out the dangers they run by waiting until the last moment."

The deaths amongst children under 5 years of age were 235, or 18·5 per cent. of the total deaths. This is very excessive, and is to a large extent due to malnutrition consequent on improper feeding.

There were 582 births in the maternity ward with 17 deaths.

Nursing Staff.

The Nurse Superintendent had to relinquish her appointment in December, 1911, on account of ill-health, and was succeeded by the Junior Divisional Nurse.

During the year, 167 lectures were given and practical demonstrations held in the wards in connection with the various classes.

Public Hospital, New Amsterdam.

This institution has accommodation for 96 males and 54 females. There were 3,711 patients admitted and with 156 remaining on April 1, 1911, make a total of 3,867 patients treated. The number of out-patients treated was 27,372. There were 396 deaths, which gives a death-rate of 10·2 per cent. of the cases treated. Of the total deaths 45, or about 11·3 per cent., died within twelve hours of admission and 47, or 11·8 per cent., within twenty-four hours of admission. There were 67 births in the maternity ward.

It is interesting to note that the quarters formerly used by the Nurse Superintendent have been converted into a children's ward, which the Resident Surgeon rightly describes as a "long-felt want." The cots, fourteen in number, were presented by friends in the county, following the good example set at the Public Hospital, Georgetown, at which all of the cots—thirty-one in number—were given for the children's ward by friends.

The training of nurses at this institution is, I regret to say, still suspended, as no provision has been made for appointing a superintendent of nurses. At the last annual session of the Combined Court I endeavoured to get this replaced; the Court voted the salary, but refused to provide the necessary accommodation; the latter is essential, as a nurse cannot be appointed until provision is made for her accommodation.

Public Hospital, Suddie.

This institution has accommodation for 54 males and 26 females. There were 1,437 patients admitted, and with the 84 remaining on April 1, 1911, make a total of 1,521 patients treated. The number of out-patients treated was 6,160. There were 199 deaths, which gives a death-rate of 13 per cent. of the cases treated. Of the total deaths no fewer than 156 died within seventy-two hours of admission. There were 24 births, of which 6 were still-born.

A vast improvement has been made in the surroundings by cutting down the dense bush between the hospital and the public road.

This piece of land had been used in the past for burning earth for road metal, the consequence being the formation of an enormous number of pits which were ideal breeding grounds for mosquitoes. These have been filled in, and the ground drained.

Public Hospital, Bartica.

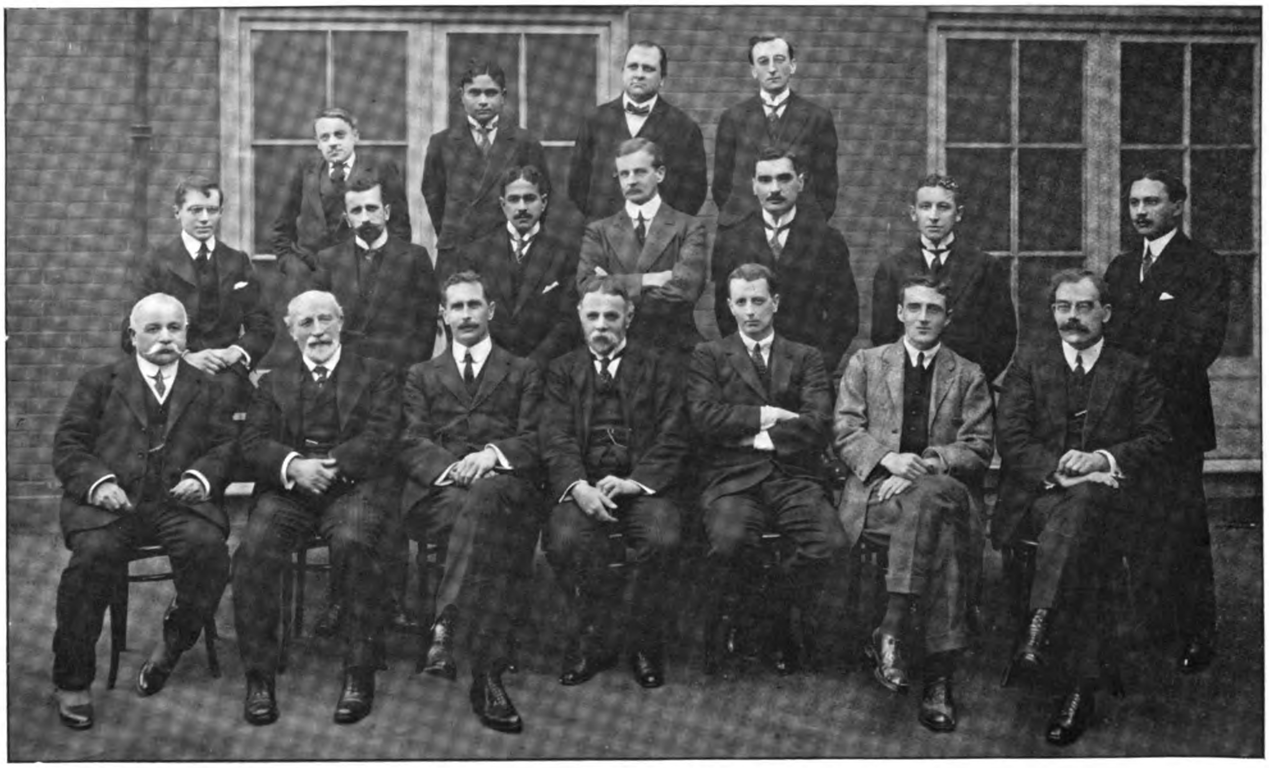
This institution has accommodation for 24 males and 11 females. There were 355 patients admitted and with the 10 remaining on April 1, 1911, make a total of 365 treated. The number of out-patients treated during the year was 1,058. There were 44 deaths, which give a death-rate of 12·5 per cent. of the cases treated. Of the total deaths 10 died within twenty-four hours of admission. There were 12 births during the year.

Public Hospital, Morawhanna and Arakaka Ward.

The hospital at Morawhanna has accommodation for 14 males and 11 females, and the Arakaka Ward

LONDON SCHOOL OF TROPICAL MEDICINE.

47th Session. January—April, 1915.



Back Row.—Robert (*2nd Laboratory Assistant*), P. T. Patel, G. B. Warren (*1st Laboratory Assistant*), S. A. McSwiney.
Middle Row.—W. L. Peacock, G. Campbell, E. Baños, W. J. J. Arnold, E. Barcenas, R. Bruce-Low, P. Rengito.
Front Row.—G. P. Jordan, Mr. J. Cantlie (*Senior Surgeon*), H. B. Newham (*Director*), Dr. C. W. Daniels (*Lecturer*), H. M. Hanschell (*Deputy Director*), J. W. Thomson (*Assistant Entomologist*), E. Cartwright.
Absent.—R. Semple, R. Biltris, R. Lauwens, Col. A. Alcock (*Entomologist*), R. T. Leiper (*Helminthologist*), J. G. Thomson (*Protozoologist*) R. P. Cockin (*Demonstrator*).

LONDON SCHOOL OF TROPICAL MEDICINE

(UNIVERSITY OF LONDON),

Under the Auspices of His Majesty's Government,

CONNAUGHT ROAD, ALBERT DOCKS, E.

In connection with the Albert Dock Hospital of the SEAMEN'S HOSPITAL SOCIETY.

THE SEAMEN'S HOSPITAL SOCIETY was established in the year 1821 and incorporated in 1833, and from time to time has been enlarged and extended. It now consists of the Dreadnought Hospital, Greenwich, to which is attached the London School of Clinical Medicine; the Royal Victoria and Albert Docks Hospital; the East and West India Docks Dispensary; and the Gravesend Dispensary.

Over 30,000 Patients treated annually. Of this number many are Cases of Tropical Disease.

The School buildings are situated within the grounds of the Royal Victoria and Albert Docks Hospital.

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E. TREACHER COLLINS, Esq., F.R.C.S.
C. W. DANIELS, Esq., M.B., F.R.C.P., M.R.C.S.
KENNETH W. GOADBY, Esq., D.P.H.(Camb.), M.R.C.S., L.R.C.P., L.D.S.R.C.S.
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G. C. LOW, Esq., M.A., M.D.
J. M. H. MACLEOD, Esq., M.D., M.R.C.P.
Sir PATRICK MANSON, G.C.M.G., F.R.S., LL.D., M.D., F.R.C.P.
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H. WILLIAMS, Esq., M.D., M.R.C.P., D.P.H.(Camb.

Dean—SIR F. LOVELL, C.M.G., LL.D. **Arthropodist**—Colonel A. ALCOCK, I.M.S., C.I.E., F.R.S.
Helminthologist—R. T. LEIPER, D.Sc., M.B., Ch.B., F.Z.S. **Protozoologist**—J. G. THOMSON, M.B., Ch.B.(Edin.)
Director—H. B. NEWHAM, M.R.C.P., M.R.C.S., D.P.H., D.T.M. & H.(Camb.). **Secretary**—P. J. MICHELLI, C.M.G.

LECTURES AND DEMONSTRATIONS DAILY BY MEMBERS OF THE STAFF.

There are three Sessions yearly of three months each, October 1st, January 15th, and May 1st. A Course in Tropical Sanitation and Hygiene is held in the October and May Sessions. Women Graduates are received as Students.

Certificates are granted after Examination at the end of each Session, and the course is so arranged as to equipment for the D.T.M. & H.Camb., the D.T.M. Eng., and the M.D. Lond., and by London University in Branch VI. (Tropical Medicine).

Fee for course £16 16s.; shorter periods by arrangement.

Students can be provided with Board and Residence, or partial Board, at the School.

Medical men requiring posts in the Tropics may apply to the Secretary at the School, where a Register is kept.

A syllabus, with the general course of study, can be had on application to the undersigned, from whom further information may be obtained.

Students of the London School of Tropical Medicine, who join the London School of Clinical Medicine, will be allowed an abatement on their fees and *vice versâ*.

Chief Office—SEAMEN'S HOSPITAL, GREENWICH, S.E.

Return of Diseases and Deaths in 1911-12 in British Guiana.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	27	—	27
Anæmia	178	11	178
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	5	2	5
Chicken-pox	1	—	1
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	322	124	322
Delirium Tremens	1	—	1
Dengue	—	—	—
Diabetes Mellitus	6	—	6
Diabetes Insipidus	—	—	—
Diphtheria	40	—	40
Dysentery	483	129	483
Enteric Fever	4	—	4
Erysipelas	6	—	6
Febricula	9	2	9
Filariasis	—	—	—
Gonorrhœa	233	—	233
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	14	—	14
Kala-Azar	—	—	—
Leprosy	5	—	5
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	26	—	26
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	1699	54	1699
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	15	—	15
(*c*) Pernicious	31	8	31
(*d*) Malarial Cachexia	27	1	27
Malta Fever	—	—	—
Measles	—	—	—
Mumps	5	—	5
New Growths—	—	—	—
Non-malignant	71	—	71
Malignant	71	17	71
Old Age	—	—	—
Other Diseases	37	7	37
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	17	17	17
Rachitis	—	—	—
Rheumatic Fever	2	1	2
Rheumatism	351	—	351
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	78	72	78
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	36	—	36
(*a*) Primary	8	—	8
(*b*) Secondary	59	4	59
(*c*) Tertiary	148	7	148
(*d*) Congenital	19	8	19
Tetanus	33	20	33
Trypanosoma Fever	—	—	—
Tubercle—	79	28	79
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	115	—	115
Yaws	18	—	18
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	971	18	971
Circulatory System	365	68	365
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	1739	200	1739
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	34	—	34
Eye	338	—	338
Generative System—	—	—	—
Male Organs	672	1	672
Female Organs	1802	86	1802
Lymphatic System	205	—	205
Mental Diseases	—	—	—
Nervous System	482	36	482
Nose	13	—	13
Organs of Locomotion	257	2	257
Respiratory System	2206	593	2206
Skin—	827	2	827
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	1127	271	1127
Injuries, General, Local—	757	11	757
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	1	1	1
(*c*) Other Injuries	—	—	—
Parasites—	699	74	699
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	26	—	26
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	6143	50	6143
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

for 12 males. There were 475 patients treated and 41 deaths, which gives a death-rate of 8·4 per cent. of the cases treated. Of the total deaths 17 died within twenty-four hours of admission. There were 2,030 out-patients treated.

Lunatic Asylum.

There were 469 males and 299 females in the Asylum on April 1, 1911. During the year 75 males and 56 females were admitted, 36 males and 31 females were discharged, and 42 males and 23 females died. The percentage of mortality on the total number of inmates was 7·2.

Leper Asylum.

On April 1, 1911, there were 299 males and 123 females in the Asylum. During the year 104 males and 35 females were admitted, and on March 31, 1912, there were 306 males and 134 females in the Asylum. There were 73 deaths, 49 males and 24 females. The percentage of mortality on total number of inmates was 13.

The farm was kept in good order and produced:—

Ground provisions, 49,987 lb. to the value of	..	$499.87
Coco-nut oil, 31 gallons, valued at	.. ..	$24.80

The yield from the farm was adversely affected by the drought.

The majority of the inmates keep their cottages and grounds neat and tidy. They are given small plots of ground in which during their spare time they are allowed to grow vegetables, and these are either used by themselves or sold to the store for consumption within the Asylum.

PUBLIC DISPENSARIES.

Georgetown.

There are three dispensaries in the city, each having its own medical officers, and seven in the country; in the latter the dispensers in charge are provided with corials for the purpose of paying periodical visits to the different grants, homesteads, and missions. Potaro, 11½ miles from Potaro Landing, is provided with six beds for the reception of urgent cases.

PRISON HOSPITALS.

The following shows the number of prisoners admitted; there was only one death in these hospitals during the year:—

Institutions.	Admitted. M.	F.
H.M.P. Settlement	77	—
Georgetown	91	10
New Amsterdam	22	3
Suddie	24	1
Total	214	14

SUGAR ESTATES.

At the close of the year there were 39 estates' hospitals with a total of 2,458 beds.

Forty-two thousand and forty-four patients were treated in the estates' hospitals, being a decrease of 10,669 on the previous year. There were 1,172 deaths as against 1,857 for the previous year, which gives a death-rate of 2·8 per cent. of the cases treated.

It is interesting to report that the decrease in the number of cases of infantile convulsions mentioned in my report for last year still continues. In 1909-10, there were 195 cases with 57 deaths; in 1910-11, 138 cases and 29 deaths; in 1911-12, 100 cases and 23 deaths. This reduction is, I am sure, due entirely to the systematic giving of quinine to the children.

VACCINATION.

Glycerinated lymph is imported for the use of the public vaccinators, to whom it is supplied free of charge. There were 1,284 successful vaccinations during the year.

HEALTH OF THE COLONY.

It is satisfactory to report that the colony has been free from such dangerous infectious or contagious diseases as plague, yellow fever, and small-pox.

The death-rate of the whole colony was 31·7 per 1,000 as againt 34·4 per 1,000 for the previous year; the birth-rate was 28·8 per 1,000 as against 27·5 for the previous year.

Pneumonia still claims a large number; at the Public Hospital, Georgetown, 388 cases were treated with a death-rate of 42·2 per cent.; of these 20·7 per cent. died within twenty-four hours and 53 per cent. within seventy-two hours of admission.

Enteric Fever.—The Resident Surgeon, Public Hospital, Georgetown, calls attention to the large increase for the year; there were 108 cases with 37 deaths against 60 cases with 19 deaths for the previous year. The disease has been made a notifiable one, so that in future it will be possible to give definite statistics and its distribution.

The mortality amongst children under one year, it is to be regretted, still continues far in excess of what it should be. In 1910 there were 1,954 deaths or 235 per 1,000; in 1911 there were 1,865 deaths, or 229 per 1,000. The mean rate for the past five years was 223 per 1,000.

During the year, tuberculosis was the cause of 7·3 per cent. of the total mortality of the colony as against 6·8 per cent. for the previous year, and in Georgetown, 9·2 per cent. as against 8·8 per cent. for the previous year.

The Society for the Prevention and Treatment of Tuberculosis has continued its good work during the year. I know, from being in close touch with the working of this Society, that the scope of its work is being gradually extended, but the want of funds stands in the way. Its operations have now been extended by the appointment of a "Lady Visitor" who visits the cases under treatment, gives advice as to the means to be taken to prevent the spread of infection to others, and endeavours to persuade those afflicted to take advantage of the Tuberculosis Ward at the Public Hospital, Georgetown. This disease has likewise been made notifiable.

Colonial Medical Reports.—No. 50.—British Guiana (*contd*).

Malarial Fever and Anti-malarial Measures.—The Supplementary Report promised in my last Annual Report was issued during the year. In that Report the number of cases of malarial fever treated in each estate hospital for each of the five years 1906-07, 1907-08, 1908-09, 1909-10, 1910-11 is shown separately. The total number of cases treated in 1906-07 was 33,748; in 1910-11, they had fallen to 21,063; and I am pleased to report that in 1911-1912 they had fallen to 15,169. This plainly shows what can be accomplished by anti-malarial measures, which, on the estates, consists of:—

(1) Abolition of mosquito breeding grounds, including the screening of tanks, barrels, and other receptacles for storing drinking water, clearing the yards of old tins, bottles, &c., and keeping the drains and trenches clean and free of grass, so as to allow the small fish to get at the mosquito larvæ.

(2) The free distribution of quinine to the resident labourers and especially to the children.

In the city of Georgetown, the health officer has instituted a vigorous campaign against mosquitoes, which, I am sure, will be followed by good results. The fight must be a continuous one, and with the assistance and co-operation of those that suffer, not only from the diseases carried by mosquitoes, but the pain produced by their bites, we shall win in the end.

I very much regret to have to record year after year in my annual reports that the town of New Amsterdam has done nothing; it is not to their credit that the authorities should so persistently refuse to undertake anti-malarial measures.

The Government still continues the sale of quinine at the various post-offices throughout the colony. All prisoners, members of the Police Force and their families, the boys at the Industrial Schools, at Onderneeming and the Orphan Asylum, and attendants at Government Medical Institutions are supplied with quinine free.

The following are taken from the reports of the medical officers:—

Dr. Castor, Enmore District.—It is most gratifying to note how fully this measure (the systematic administration of qninine) has justified its adoption. Not only has it very greatly reduced the admissions to hospital and mortality amongst adults, but there has been no case of infantile convulsions that could fairly be attributed to malaria.

Dr. Kennard, Port Mourant District. — Albion Hospital. There were 338 cases of malarial fever with 3 deaths as against 792 cases with 9 deaths for the previous year.

Port Mourant: 57 cases of malarial fever with 1 death against 182 cases with 5 deaths the year before.

Dr. Ferguson, Peter's Hall District, in his very interesting report, points out that on the four estates comprising Plantation Diamond, with 5,150 East Indians residing in the four nigger yards, exclusive of those residing in villages, pastures, &c., the death-rate was 20·3 per 1,000 as against an average of 24·7 per 1,000 for the three previous years. The birth-rate was 29·8 per 1,000 as against an average of 29·7 per 1,000 for the three previous years. He says: "It will be seen that last year the birth-rate exceeded the death-rate by 9·2 per 1,000, and that the death-rate was 4·4 per 1,000 less than the average of the three previous years. For some years past the birth-rate has been increasing and the mortality diminishing on these estates, especially Providence. I attribute this chiefly to the care exercised in the curative and preventive treatment of ankylostomiasis and malarial fever, the two main causes of sickness and death among the estates' coolies."

Dr. Ferguson's remarks on malaria and ankylostomiasis are exceedingly interesting and very instructive, and show what can be done. I am having his remarks and recommendations embodied in a special circular which I propose to send to all medical officers and managers of estates.

A spleen census of all children on the sugar estates is taken every half-year in accordance with the following circular, which I issued in May, 1911:—

"Surgeon-General's Office,
"Georgetown, Demerara,
"*May* 22, 1911.

"Spleen Censuses.

"Sir,—I have the honour to inform you that I have decided to have half-yearly spleen censuses taken so as to ascertain the results obtained from the systematic administration of quinine to the children of East Indian immigrants resident on sugar estates, which I am glad to say is now almost universal on all estates in the colony.

"(2) I enclose a specimen form showing the information required. The census must include all children on the quinine list living on the estate proper and a separate form must be used for each estate.

"(3) I consider this matter a very important one and shall be pleased to have your assistance and hearty co operation in carrying it out.

"(4) The census returns should reach this office not later than January 15, and July 15, every year.

"J. E. Godfrey,
"*Surgeon-General.*

"To all District Government Medical Officers."

Drinking Water.—The drought, which lasted from August to the end of the year under review, was a very great strain on the drinking water supplies.

On those estates and villages connected with the large water schemes of the East Coast Conservancy, Lamaha, and Boerasirie, the supply held out. In the county of Berbice the few wells there did good service.

At the best of times the water supply is not satisfactory, owing to its being usually stored in open trenches or ponds which can be, and are, so easily polluted, more especially during the rainy weather. The bacteriologists to whom was assigned the duty of looking after the drinking water did most excellent work in visiting the different estates and villages and advising on the best way of purifying the water; the method adopted was by precipitating the mineral and vegetable impurities by alum, and then sterilizing by means of chlorinated lime.

The Drought Committee, recognizing the great importance of an adequate and pure water supply,

recommended that a boring plant, capable of boring to a depth of 1,000 ft., be imported for the purpose of ascertaining whether it is possible to sink artesian wells in this colony. If this is successful we shall go a very long way to solve the drinking water problem for the colony generally.

Ankylostomiasis. — On the sugar estates the measures which have now for some time been advocated by this department have been continued.

(1) The erection of latrines.

(2) The systematic examination of all newly arrived immigrants and of all persons suffering from anæmia or showing the least sign of being infected with the ankylostome parasite.

(3) The treatment and constant observation of all known infected cases.

In this connection it is pleasing to report that every estate is now supplied with latrines. There has been a very marked diminution of the number of cases, particularly of those severe cases which were so common a few years ago. It has also been found practical and advisable to treat the milder infected cases as out-patients.

The introduction every year of a large number of ankylostome-infected East Indian immigrants is a very serious factor in preventing not only much better results, but also the eradication of the disease.

Quarantine.

During the year there was :—

(*a*) Yellow fever in Barbados (2 cases), and St. Vincent (1 case).

(*b*) Plague in Trinidad, Venezuela, and Port Durban.

(*c*) Small-pox in Barbados (1 imported case).

The precautions permitted by the Quarantine Regulations were enforced and I am pleased to say there was no case of infection.

The disinfecting machines were regularly tested and found to be in good working order.

Subsidized Nurse-midwives in Districts.

During the year eighteen women qualified as nurse-midwives. Two students received subsidies amounting to $10, to assist in maintaining themselves whilst undergoing training at the public hospital, Georgetown. The examination for these certificates is very much more difficult than formerly. In addition to certificates, sign-plates are now given to those women who are certified by Government examination. Midwives' outfits are obtained from the Medical Supply Association and supplied without charge to certain nurse-midwives, to enable them to be in a position to properly perform their duties. I look forward to the day when every village will have at least one qualified nurse-midwife.

The scheme started in July, 1908, for providing an outdoor maternity department has worked very satisfactorily, and is being largely taken advantage of by poor women who do not for one reason or another care to go to the public hospital. For the year 1911-12, 170 cases were attended and 4,208 visits paid.

The work of the outdoor midwives is supervised by one of the divisional nurses, but the work has so grown, and is still growing, that the time is approaching when it will be necessary to have a skilled nurse in charge of this most important department.

There are five subsidized nurse-midwives in the following outlying districts: Mahaicony, Pomeroon, Moruca, Enmore, and Mahaica.

Bacteriological Department.

Important work has been done in this department during the year.

The assistance rendered by the bacteriologists, not only to the staff of the public hospitals, but to private medical practitioners, in assisting in the diagnosis of difficult and doubtful cases is well known, and, I am sure, fully appreciated. The routine work of the laboratory continues to increase, the total number of specimens dealt with being 5,252 as against 4,481 for the previous year.

During the year the bacteriologists completed a mosquito census of the city of Georgetown. It should be of the greatest assistance to the health officer of the city in taking measures to abolish the breeding grounds of mosquitoes, as each yard is dealt with separately.

The bacteriologists completed their investigations with regard to the treatment of leprosy by nastin. The conclusions arrived at are as follows :—

(1) That nastin has apparently very little beneficial effect on cases of leprosy.

(2) A solution of benzoyl chloride in oil shows a slightly higher percentage of improvement than nastin.

(3) Anæsthetic cases of leprosy run a definite course, after which the disease seems to die out, leaving the patient no longer infective.

(4) These cases recover sensation after a time in areas previously anæsthetic; and after self-amputation only scars remain. This is a natural process and takes place without any treatment whatever; it is not apparently influenced by either nastin or benzoyl chloride.

(5) Nodular cases do not tend to improve naturally as above, except in very rare instances; nor do they appear to be affected appreciably by either nastin or benzoyl chloride.

(6) The so-called destruction of bacilli is a natural process varying considerably, and does not appear to be influenced by nastin or benzoyl chloride.

(7) Variation in the amount of destruction of bacilli observed is of limited value as an indication of the effects of treatment.

(8) Benzoyl chloride in petroleum oil is extremely valuable as a nasal spray or a paint for ulcerating surfaces. It quickly renders the discharge free from the presence of bacilli.

(9) Its regular use for this purpose is strongly recommended in leper asylums.

It is disappointing, as we looked forward to the nastin treatment to supply the curative agent for this dread disease. Although nastin has not come up to our expectations, yet its discovery has done an enormous amount of good, as it has stimulated many additional observers and investigators to a closer study of the disease with a view of discovering a cure. Our bacteriologists, in conjunction with the Medical Superintendent of the Asylum, are doing their share in extending their scientific investigations.

Colonial Medical Reports.—No. 51.—Tobago.

MEDICAL REPORT ON THE EPIDEMIC OF DYSENTERY IN TOBAGO.

By **H. L. CLARE.**

Surgeon-General.

It may be ascertained from a study of the Registrar-General's returns of deaths in Tobago for the last five years that dysentery in some form or another prevails endemically in Tobago, although not to such an extent as to have attracted any special attention or comment in recent years. In the latter six months of each of the five calendar years since 1907 there has been an average mortality from dysentery of 20, and as a mortality rate per case of this disease is not usually very high, these 20 deaths half-yearly probably represent a considerable and regular incidence distributed over the whole island, as deaths from dysentery are returned from all of the sub-districts of registration. Towards the latter part of June, 1912, however, dysentery occurred with unusual frequency in scattered settlements in the south-west and central parts of Tobago; it tended to assume a severe type of acute infection, rapidly attained epidemic proportions, and was attended with more than the usual mortality.

Immediately on the first intimation of epidemic prevalence I proceeded to Tobago accompanied by an additional medical officer, Dr. George, and a trained sanitary inspector, and my report of the situation as I found it then, which was submitted for the Governor's information, detailed the relief measures that I had put in training, and the duties assigned to the additional officers I had sent to assist in dealing with the epidemic. Subsequent to my visit it was found necessary to open a temporary hospital on July 21 at Bon Accord, a convenient centre in the south-west district, and within a few more days the need of special hospital accommodation asserted itself in the Central District also, where the school-house at Adelphi, close to the District Medical Officer's residence, was utilized for this purpose on July 29. Large numbers of patients were treated at these two emergency hospitals and also at the Yaws Hospital, where a vacant ward was used for the reception of dysentery cases under a separate staff; other patients were treated at their homes, and for some who were less severely attacked and in the early stage of illness treatment as out-patients at the various health offices in the different medical districts proved satisfactory. Nevertheless, with these facilities easily available on application within comparatively limited areas it is reported that many cases of dysentery occurred that did not obtain any professional treatment.

Within a few weeks the disease appeared to be subsiding, both in degree of incidence and of virulence, in the south-western area, but in the central parts improvement was more delayed, and on August 8, when Dr. George was able to report his hospital closed at Bon Accord, he was transferred to help Dr. Gibbon in the mid-district. Dr. George remained there until the death of Dr. Thomson, District Medical Officer, Roxboro, on September 2, at which date conditions were easier, and he was appointed to assume acting duty as District Medical Officer in the Roxboro or Windward District. I revisited Tobago on September 20 to 24, inspecting several districts and inquiring into the epidemic status, and the information thus obtained was encouraging. A fresh outbreak of dysentery in the south-west occurred, however, early in October in the elevated hilly portions centred at Montgomery and Patience Hill. To meet this situation an emergency hospital was opened at Montgomery, and Dr. Blood was sent over from Trinidad on October 21 and placed in charge there; he was able also to render valuable assistance to Dr. Gibbon in the mid-district, where the disease still persisted.

It was desirable that there should be made some skilled investigation of the origin and course of the epidemic, and that the facts and information in relation to it should be co-ordinated as far as possible with the view of affording a more intelligible comprehension of the outbreak than had been obtained hitherto. With this object Dr. Dickson, the Government Bacteriologist, was directed to proceed to Tobago and to conduct whatever investigation might be feasible in his judgment, and his valuable and instructive report, accompanied by a map, interesting charts, curves and other details, and embracing the period from the outbreak up to October 31, was received on November 11. At this date the epidemic had not subsided, and my report brings the figures up to December 31, 1912, when it may be assumed, I think, that epidemic prevalence of dysentery in Tobago had ceased, at any rate for the present, and that the ordinary conditions had been restored there. Reports about any unusual prevalence of dysentery in the Windward or Roxboro Medical District did not come to hand, and Dr. Dickson relates that up to October 31 the cases there were relatively few and distributed generally over the district. But it now appears that this part of the island had not altogether escaped the epidemic, and later returns exhibit a considerable

incidence of the disease in the Windward District also, which attained its maximum intensity there in October and has slowly declined since then, but has not yet quite disappeared. Roxboro Settlements, Charlotteville and Speyside were the sub-districts most heavily attacked here.

The figures at my disposal account for a total of 3,179 cases of dysentery and 466 deaths in Tobago up to December 31, 1912, distributed in the following localities and yielding in each of these the case-mortality rate recorded below, viz.:—

	Cases	Deaths	Case-mortality rate
Scarborough Medical District (including the south-west area)	869	135	15·5
Northside or Plymouth Medical District (including the central area) ..	1,616	190	11·7
Scarborough Town and neighbourhood	347	94	27·1
Windward or Roxboro Medical District	347	47	13·5
Totals ..	3,179	466	14·6

The conditions of origin and development of the epidemic, its nature and extent, leave no doubt that the disease conformed to the bacillary variety of dysentery. In some instances (Dr. Dickson found 1 out of 12 cases he examined microscopically) the amœbic organism *Entamœba histolytica* was present probably in combination with the bacillary, as mixed infections are not uncommon. One of the medical officers noted in many cases the frequent presence of ascarides in large numbers, and that preliminary treatment for their expulsion seemed to aid the further treatment of the dysenteric condition. Several more or less distinct *Bacilli dysenteriæ* bearing close resemblance to the coliform group have been isolated by different observers and it is not improbable that infection by any one of these varieties might be disseminated by the same influences that were prominent in this epidemic. At any rate the difficulty of identifying the particular organism that doubtless was present as the specific factor in almost every case was here practically insuperable. Our present knowledge of the life-history of the several organisms included under the general name of *B. dysenteriæ* is inexact and limited, the behaviour and survival of the bacillus under different conditions—*e.g.*, in water—have not yet been determined with precision, and although the bacillus has been isolated from dysenteric dejecta and some of its morphological and cultural features have been described we are still without accurate knowledge of many characteristics of the organism that have important bearings upon the progress and control of the disease with which it is associated.

In comparatively recent times polluted water and milk were held to be the main if not the only causes of epidemic typhoid fever—a disease caused by a specific bacillus which is closely allied in some respects to the *B. dysenteriæ*—and it has been established on unimpeachable testimony that they may be dangerous agents for widespread diffusion of the specific infecting organism. Public Health authorities therefore on the advice of their experts have devoted enormous sums of money to the provision of water supplies obtained from sources selected for their freedom from any exposure to contamination, and in their collection and distribution all possible risks of pollution have been excluded. The wisdom of such a policy is indisputable, but later scientific research has brought to light that even the most perfect system of water supply is not sufficient of itself to protect the community that enjoys it from the infection of typhoid fever, and that many other and perhaps more prolific sources of infection must be reckoned with. Amongst these other sources of typhoid infection that are recognized now there are "carrier" cases of typhoid fever, convection of the infecting organism in wind-borne dust and in articles of clothing and bedding soiled by the dejecta, contamination of food and food utensils by infected flies, the consumption of uncooked vegetables and fruits, besides the direct personal infection that may result from insufficient care or disinfection, improper disposal of the highly infectious excreta, and the lack of personal cleanliness in the control and management of individual cases of the disease.

Now dysentery also is included amongst the water-borne diseases, although the evidence in support of this theory, especially in regard to the bacillary type, is not so abundant nor so conclusive as it is in the case of typhoid fever. The specific infecting organism in each disease is of a closely allied type, extremely delicate, and in its extra-corporeal existence the *B. typhosus* is exposed to many influences that are known to be inimical to its prolonged vitality. For example, in natural waters the uncultured *B. typhosus*, or actual pathogenic organism as it occurs in the individual, is not able to survive for any prolonged period, and indeed it is now asserted by eminent authority that without any other treatment the mere storage of impure water for even a week is practically fatal to the persistence in it of this organism. For analogous reasons it may well be, in the absence of any proof to the contrary, that the *B. dysenteriæ* is not endowed with any greater powers of survival in its extra-corporeal life (which is known to be short) that the allied *B. typhosus* is proved to possess, but that the *B. dysenteriæ* also is subject to the like disabilities of vitality that affect its prototype. The agents besides water convection that are admittedly effective in the causation and spread of typhoid fever are believed to operate also in the spread of dysentery, and therefore it is at least possible, if not highly probable, that in epidemic prevalence of bacillary dysentery these same agents independent of any water convection may be the principal active factors in the extension of that disease where it is known to exist already in endemic form in a community.

Popular outcry in this as in many other instances of epidemic outbreak of disease is at once directed against the water supply, which affords to the uninformed mind a convenient scape-goat and suggests a facile solution of an etiological problem that is perhaps the most difficult to refute or establish of any that may confront the Medical Officer of Health.

Colonial Medical Reports.—No. 51.—Tobago (*continued*).

It is clear from the foregoing observations that in tracing the causes of water-borne diseases a minute investigation of the subject must include scientific incursions into many other fertile and equally elusive channels of origin besides water, and when all the data that might be furnished by such an expert examination are available then only does a critical consideration of the problem become possible, and it sometimes affords grounds for conclusions that indicate fairly closely, perhaps, the actual origin of the disease, while in other cases it does not warrant more than a suggestion as to the lines on which measures may be wisely directed in future to safeguard the community from the particular epidemic recurrence. Bearing in mind the endemic prevalence of dysentery in Tobago, having regard also to the other data at my disposal in this inquiry, it appears that excluding "carrier" cases of dysentery (of whose existence there we are unfortunately without any direct proof, although their presence and influence can hardly be denied) all the other potential factors enumerated above were operative in Tobago in a combination and to a degree that are adequate in my opinion to explain the spread and persistence of the recent epidemic, if not its actual origin, without directly incriminating the water supply at all in any of the affected districts.

A prolonged drought of almost unprecedented severity had visited Tobago during the six months before the outbreak of dysentery, and had very seriously diminished the ordinary resources and food supplies of the rural population, inducing a state of poverty if not of actual privation amongst a community who at the best of times are not very far removed from these direful straits and are notoriously unprovided to contend against their advent and persistence for even a brief period. The lowered vitality and resisting powers of the labouring population occasioned by these malign influences provided a large number of individuals easily susceptible to the invasion of an acute infectious disease whose incidence at the outset and throughout its course was apparent, especially amongst those at the extremes of age and least capable of resisting the sudden onslaught of illness. The evidence adduced in Dr. Dickson's comprehensive report of the primitive and highly insanitary methods of disposal, or rather lack of disposal, of human dejecta, the accumulations of manure heaps and other refuse in close proximity to human habitations, the consequent prevalence of flies, the reluctance or indifference of the patients and their relatives to seek early medical assistance that was within reach, the use of unsuitable food, the disregard in many cases of skilled advice and treatment that were prescribed by the medical officers, and the preference of the people for "bush remedies" and superstitious resort to obean-men of which other independent testimony is available—all these and other potent influences simply courted the invasion of a population which tolerates and encourages them by the germs of infectious disease, and they are largely responsible for the severity and persistence of the epidemic. "Drought, famine pestilence" was the sequence of events dramatically described by an influential and well-informed resident, but to complete the series I would add uncleanliness, ignorance, superstition—truly a formidable and well-nigh irresistible combination of circumstances to deal with.

But if it be conceded that the other sources of infection besides the water supply were mainly instrumental in the origin of the epidemic—and exact determination of this appears to be impossible—the very unsatisfactory nature of the water supply must not be ignored altogether in this connection. The conditions of water supply in the most heavily stricken area of Tobago are about as bad as could be conceived and they constitute a standing menace to the general health of the inhabitants and a stumbling-block to the effective institution of any sanitary improvement. Dr. Dickson unhesitatingly condemns all the sources of supply that he investigated, which he described as "unsafe and dangerous." Mr. Hitchins, the District Engineer of Tobago, in a valuable report that he submitted on the water supply of the affected area, condemns nearly all the wells and sources whether private or under Government control. He records his conviction that only two of the Government wells are safe and that all the private wells are unsafe; many of them had yielded most unsatisfactory results upon even superficial chemical analyses of their waters.

The whole area, except that portion watered by the Courland River, is dependent for water upon shallow wells, or springs and temporary surface collections of water at the bottom of deep ravines into which drain, and are washed by successive rainfalls, all the accumulations of fæcal and other refuse that is habitually deposited close to the dwellings scattered over the slopes. In the low-lying level area at the south-west part of the island the shallow wells, originally of crude and imperfect design, indifferently protected from surface washings, unfitted with suitable or in some cases any facilities for drawing the water, and suffered to fall into disrepair, are the only available sources of supply except a few small tanks, barrels and similar expedients. When regard is had to the habits of the population and to their primitive methods of sewage disposal it is not difficult to realize the gross pollution to which the subsoil water is liable throughout this area of coral formation and to which the opportunities for universal surface contamination of the wells and springs must also contribute heavily.

Even the best designed and constructed wells which tap a polluted subsoil water should not be entertained as sources of public supply, and quite apart from any bearing these wells may have had upon the recent epidemic their universal condemnation by the Medical Officer of Health, the Government Analyst, and the District Engineer—the authorities on the subject whose advice is usually accepted—affords a strong argument, not for their constructional repair, as has been decided upon, but for their abandonment at the earliest possible date and for the substitution of the pure and abundant supply that has been proposed.

In his report dated October 22, 1912, to which reference is made above, Mr. Hitchins outlines an excellent scheme for providing what appears to be a perfectly safe and abundant supply free from any risk of contamination, obtained from a source some 500 ft. above sea level, to be delivered by gravitation to the town of Scarborough, where the present supply is limited and not above suspicion, and distributed thence over an extensive area of considerable population and agricultural wealth. The initial cost of this scheme appears to be moderate, and Mr. Hitchins thinks the annual cost, including interest and sinking fund on a small loan for the purpose, need not exceed £1,600 to £1,800 per annum, which he suggests might be covered by a small rate on the area supplied. This excellent proposal might be fully considered at once from its financial and other aspects with a view to its immediate adoption if Mr. Hitchins' conclusions in regard to it are confirmed. Even if it should not be found practicable to recoup the annual charges by a water-rate the additional imposition of less than £2,000 a year on expenditure from General Revenue should not be an insuperable obstacle to the scheme, which might well be conceded priority of claim over some other proposals the adoption of which is not so urgently demanded nor of such vital importance to a community as is the provision of a pure water supply.

At the earliest opportunity, therefore, and in the first stage of any attempts to introduce better sanitation in Tobago and to inculcate habits of cleanliness amongst the peasant population, a pure and adequate water supply should occupy the foremost position, and it could not fail to effect far-reaching improvement in these as well as in many other important directions. I recommend also that a trained medical officer of health should be resident in the island, having a competent assistant sanitary inspector under his control in each of the medical districts to introduce and secure compliance with the necessary reforms in elementary sanitation that are now so obviously lacking. Educational efforts in training the youth of the population in habits of ordinary cleanliness and in domestic hygiene in the elementary schools should be initiated and encouraged in every practical way that is possible, and to this end Dr. Dickson's suggestions on the subject deserve consideration.

In this report opportunity occurs to express my grateful appreciation of the invaluable assistance and self-sacrificing devotion rendered under severe stress by all the medical officers, who laboured unceasingly throughout the epidemic, and by many other indefatigable and willing workers, amongst whom it is not invidious to name the Rev. Canon Brown—whose recent death in Tobago is deplored all over the island—the Rev. H. R. Davies, the Rev. T. L. Clemens, the Rev. W. Allen, and the Warden and Mr. Thomas Thornton. To all of these gentlemen the Island Ward of the Colony owes a deep debt of gratitude.

February 14, 1913.

Colonial Medical Reports.—No. 52.—Demerara.

MEDICAL REPORT FOR THE YEAR 1911.

By J. E. GODFREY.

Surgeon-General.

ESTIMATED population (1911), 295,784; births (1911), 8,530; deaths (1911), 9,385; birth-rate per 1,000 (1911), 28·8, (1910) 27·5; death rate per 1,000 (1911), 31·7, (1910) 34·4.

The relative mortality in the different quarters was: March quarter, 2,635; June quarter, 2,083; September quarter, 2,257; and December quarter, 2,410.

Malarial Fevers showed the highest number of deaths; the mortality from this cause was highest in the March quarter and lowest in the June, and in the September quarter it was higher than in the December one.

Bronchitis and Pneumonia.—The March quarter showed the largest number of deaths and the December quarter the lowest. The June and September quarters were about the same.

Diarrhœal Diseases.—The number of deaths from these diseases was greatest in the March quarter and least in the June quarter, and in the December quarter the deaths were more than in the September quarter.

Kidney Diseases.—The September quarter was responsible for the highest number of deaths and the June quarter the lowest. The number of deaths in the December quarter was higher than that in the March quarter.

Phthisis and other forms of Tuberculosis.—The March quarter showed the highest number of deaths and the December the lowest; the June and September quarters were about the same.

There were seventy-six deaths from enteric fever, and twenty-two from blackwater fever.

RETURN OF DISEASES AND DEATHS IN 1911 AT THE FOLLOWING INSTITUTIONS: GEORGETOWN HOSPITAL, BERBICE HOSPITAL, SUDDIE HOSPITAL, BARTICA HOSPITAL, MORAWHANNA HOSPITAL, INCLUDING ARAKAKA WARD.

Demerara.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	28	—	28
Anæmia	177	5	177
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	3	1	3
Chicken-pox	10	—	10
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	346	124	346
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	8	1	8
Diabetes Insipidus	—	—	—
Diphtheria	4	2	4
Dysentery	475	117	475
Enteric Fever	102	32	102
Erysipelas	9	—	9
Febricula	4	—	4
Filariasis	—	—	—
Gonorrhœa	206	—	206
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	34	—	34
Kala-Azar	—	—	—
Leprosy	1	—	1
(a) Nodular	1	—	1
(b) Anæsthetic	22	—	22
(c) Mixed	—	—	—
Malarial Fever—	92	5	92
(a) Intermittent	1636	50	1636
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	27	1	27
(c) Pernicious	27	7	27
(d) Malarial Cachexia	15	2	15
Malta Fever	—	—	—
Measles	109	—	109
Mumps	1	—	1
New Growths—	—	—	—
Non-malignant	56	—	56
Malignant	68	15	68
Old Age	20	—	20
Other Diseases	8	2	8
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	18	18	18
Rachitis	—	—	—
Rheumatic Fever	2	1	2
Rheumatism	362	—	362
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	80	77	80
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	—	—	—
Syphilis	28	1	28
(a) Primary	10	—	10
(b) Secondary	48	4	48
(c) Tertiary	147	6	147
(d) Congenital	26	11	26
Tetanus	26	17	26
Trypanosoma Fever	—	—	—
Tubercle—	73	25	73
(a) Phthisis Pulmonalis	—	—	—
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

GENERAL DISEASES—*continued*.	Admissions	Deaths	Total Cases Treated
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	9	—	9
Yaws	12	—	12
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	263	2	263
Circulatory System	367	77	367
(a) Valvular Disease of Heart	—	—	—
(b) Other Diseases	—	—	—
Digestive System—	1877	226	1877
(a) Diarrhœa	—	—	—
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(d) Abscess of Liver	—	—	—
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	—	—	—
(g) Cirrhosis of Liver	—	—	—
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	—	—	—
Ear	28	—	28
Eye	320	—	320
Generative System—	—	—	—
Male Organs	—	—	—
Female Organs	682	6	682
Lymphatic System	248	1	248
Mental Diseases	118	—	118
Nervous System	287	40	287
Nose	13	—	13
Organs of Locomotion	1788	59	1788
Respiratory System	2216	583	2216
Skin—	913	21	913
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	—	—	—
(d) Favus	—	—	—
(e) Eczema	—	—	—
(f) Other Diseases	—	—	—
Urinary System	1142	269	1142
Injuries, General, Local—	757	17	757
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	29	—	29
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	6	—	6
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	6070	47	6070
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

METEOROLOGICAL RETURN FOR THE YEAR 1911.

	Temperature						Rainfall	Wind		Remarks
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	*Mean	Amount in inches	General direction	Average force	
January	143·0	70·2	84·2	73·4	10·8	78·9	10·17	N.E.	3	
February	139·5	70·9	84·2	73·8	10·4	79·0	9·13	,,	2	
March	143·4	71·8	84·9	74·6	10·3	79·7	14·04	,,	2	Rather wet months above average.
April	143·9	71·9	84·9	74·9	10·0	79·9	8·43	,,	3	
May	145·5	71·3	85·3	74·6	10·7	80·0	11·13	,,	3	
June	146·7	70·7	85·4	74·2	11·2	79·8	12·08	,,	3	
July	146·2	70·1	84·7	73·5	11·2	79·1	9·63	,,	2	
August	148·3	71·3	86·9	74·5	12·4	80·7	4·00	,,	3	Mean temperature 0·9° above average.
September	149·0	71·7	87·7	75·0	12·7	81·3	0·55	,,	3	
October	147·6	69·7	87·9	75·3	12·6	81·6	4·02	E. N.E.	3	
November	142·1	70·1	87·2	76·0	11·2	81·6	2·30	N.E. E.	3	
December	143·4	69·8	86·0	75·2	10·8	80·6	2·41	N.E.	3	Driest December since 1899.
Total	1,738·6	849·5	1,029·3	895·0	134·3	962·2	87·89	N.E.	—	
Mean	144·9	70·8	85·8	74·7	11·2	80·2	—	N.E.	—	

* Taken in the shade.

Colonial Medical Reports.—No. 53.—Ceylon.

CEYLON HOSPITAL RETURNS FOR 1911—12.

With a Medical Report by Sir ALLAN PERRY, Kt., M.D., D.P.H.

Principal Civil Medical Officer and Inspector-General of Hospitals.

POPULATION: BIRTH- AND DEATH-RATES.

The population enumerated at the last census (March, 1911) was 4,106,350, and consisted of 7,592 Europeans, 26,663 Burghers, 2,715,420 Sinhalese, 1,059,007 Tamils, 266,625 Moors, 12,990 Malays, and 18,053 others, exclusive of the military and shipping; compared with the population at the census of 1901, there was an increase of the 15·1 per cent. in the decade. The natural increase by excess of births over deaths from the date of the last census to June 30, 1912, disappeared, and was replaced by an excess of deaths over births of 1874, while the number of Indian immigrants exceeded the number of emigrants by 45,633. The population estimated as on July 1, 1912, was 4,105,909—an increase of 113,145 persons, or 2·8 per cent. on the population at the end of 1910 estimated on the basis of the previous census.

PUBLIC HEALTH.

Vital Statistics.

I regret that the returns of deaths under their respective diseases are not available yet for the period covered by this report; but for the purpose of estimating the condition of the public health from the birth and death returns kindly furnished to me by the Registrar-General, it may be stated that the births registered during the twelve months numbered 144,019, and were in the proportion of 35·0 per 1,000 of the population per annum estimated to the middle of the period. The deaths registered during the twelve months numbered 158,921, and were equal to a rate of 38·6 per 1,000 of the population per annum. Compared with the year 1910, the birth-rate for the twelve months 1911-12 shows a decrease of 2·5 per 1,000, and the death-rate an increase of 11·3 per 1,000; compared with the average rates for the twelve years 1899-1910 the birth-rate for the twelve months shows a decrease of 3·1, and the death-rate an increase of 9·7 per 1,000.

The number of deaths registered under their respective classes of diseases for the year 1911 were:—

I.—General Diseases:—		
(a) Epidemic diseases	8,510	
(b) Septic diseases	128	
(c) Tuberculous diseases	4,769	
(d) Venereal diseases	124	
(e) Cancer or malignant diseases ..	394	
(f) Other general diseases	10,132	
		24,057
II.—Diseases of the nervous system and organs of special sense		15,737
III.—Diseases of the circulatory system		873
IV.—Diseases of the respiratory system		8,288
V.—Diseases of the digestive system		28,151
VI.—Non-venereal diseases of genito-urinary system and annexe		583
VII.—The puerperal state		3,640
VIII.—Diseases of the skin and cellular tissues ..		11,354
IX.—Diseases of the bones and of the organs of locomotion		8
X.—Malformations		23
XI.—Diseases of early infancy		6,047
XII.—Old age		3,367
XIII.—Affections produced by external causes ..		2,213
XIV.—Ill-defined diseases		39,046

Colonial Medical Reports.—No. 53.—Ceylon (*continued*).

The following defined diseases under the various heads are the most notable causes of death: Dysentery (3,464 deaths), phthisis pulmonalis (4,286 deaths), infantile convulsions (13,568 deaths), diarrhœa, exclusive of infantile (15,398 deaths), pneumonia (3,751 deaths), anchylostomiasis (2,011 deaths) and its sequelæ dropsy (3,409 deaths), intestinal parasites (4,884 deaths), puerperal septicæmia (2,127 deaths), enteric fever (661 deaths), tetanus (627 deaths), snake-bite (192 deaths), and rabies (38 deaths); 33,064 deaths are classified as due to pyrexia.

Deaths due to Preventible Diseases.—In 1911 the total number of deaths registered was 143,382, as against 110,195 in 1910; of the former number 19,432 were deaths due to what one may call preventible diseases, and include such as enteric fever, phthisis, anchylostomiasis, puerperal fever, malaria, cholera, hydrophobia, &c. Under this heading, in my 1909 report, I stated there was no control over such preventible diseases as tuberculosis, anchylostomiasis, and hydrophobia. It is gratifying to be able to state that a muzzling regulation for dogs has been introduced into municipalities and most local board towns, and also that the notification of phthisis has been made compulsory in Colombo, and it is expected that, with a modern tuberculosis dispensary, sanatorium, and hospital for chronic cases in working order, the danger to the public from the presence of carriers of tuberculosis will be considerably reduced.

Infantile Mortality.—The infant mortality in the thirty-one principal towns for 1911 was equal to a rate of 220 per 1,000 births, as against 241·7 in 1910.

The Health on Estates.—The mean birth-rate on estates for the four quarters of 1911 was 33·1 per 1,000, and the death-rate 39·0 per 1,000, compared with 33·1 and 35·9 respectively for 1910. The principal causes of death in 1911 were diarrhœa 3,208, dysentery 2,760, debility 2,939, pneumonia 1,462, anchylostomiasis 1,489, infantile convulsions 1,380, fevers 988, and phthisis 227. Of these eight groups, the numbers were higher in all. The estate population was 500,914, based on the census figures of March 10, 1911.

Principal Diseases.

Malaria.—The total number of persons treated for this disease in hospitals and dispensaries during the twelve months was 869,369, an increase of 23,675 in proportion to the number treated in the preceding eighteen months, which may be accounted for by the occurrence of an unusually severe outbreak in parts of the Western, Sabaragamuwa, and Central Provinces after the break of the south-west monsoon of 1911 following a prolonged drought. In hospitals alone 11,877 cases were treated, of whom 492 died. During the period under review the Western Province had the greatest number of cases, next the North-Western, and then the Southern Province. The fact that the two latter show a greater number of cases than the Sabaragamuwa and Central Provinces is explained by the fact that the number of estates being few, most cases came to hospital and were not treated on estates. The number of admissions into gaol hospitals for this disease was 1,213, with 15 deaths. 171,580 oz. of quinine were issued from the Civil Medical Stores at a cost of Rs. 97,505.80.

As in previous years, the measures carried out were general improvement in the sanitation of some of the towns, the education of the public by lectures and pamphlets, and the free distribution of quinine. The most prevalent mosquito-borne disease was malaria. In the town of Kurunegala in the North-Western Province in September, 1911, an anti-malarial campaign was started and is still being carried out. A medical officer was seconded for this work alone and Rs. 9,100 per annum was voted. The conveying mosquito was determined, and its breeding-places filled up or drained; unfortunately, about 260 acres of land in the town are under cultivation for rice, which forms a prevalent breeding-place of the mosquito, and Government has this matter under consideration. It is too early yet to give any statistics as to the result of these measures.

A small campaign on similar lines has been started in the town of Badulla, Province of Uva; but there again the paddy fields are a prevalent breeding-ground for the mosquito. A male and female mosquito-proof ward has been provided in each Government hospital in malarious districts. It is to be regretted that the cases of malaria treated at Government hospitals and dispensaries have increased from 559,759 in 1910 to 869,369 in 1911, and the number of deaths from 249 in 1910, to 492 in 1911.

Cholera.—The total number of cases treated during the twelve months ending June 30, 1912, was 51, of whom 36 died; 7 occurred in the Western Province with 5 deaths, 1 in the Central, which died, and 43 in the Ratnapura District. This last was a continuation of the outbreak mentioned in the last Administration Report, which began with the arrival of a cooly from India to Nikkigala estate on June 18 and showing symptoms of the disease on June 19. The inhabitants of Ratnapura were forced to use water from the river on account of the drought, and it is believed that this water was polluted with the washings from the estate.

Two vessels infected with cholera were dealt with—

(1) ss. "Koningen der Nederlanden."—The number of cases was 6, of whom 2 died on board and 4 were taken ashore to the infectious diseases hospital, where all recovered. The disease was confined to the marines on board, and they were reported to have gone ashore at Batavia, where cholera was prevailing. There were 31 contacts landed and segregated.

(2) ss. "Belle of England."—The number of cases was 5, of whom 2 died, both on board. The other 3 were treated at the infectious diseases hospital and recovered. All cases occurred in members of the crew; the infection came from Calcutta, the first case occurring five days after leaving that port. There were 44 contacts, who were treated on board.

Small-pox.—There were 304 cases treated, with 66 deaths, during the twelve months' period, which figures are in nearly the same proportion to those published for the year 1909. Every Province (except the North-Central) returned cases; the Western and Central Provinces were seriously affected, with 58 and 175 respectively; Kandy and its surrounding villages

suffered most. The original source of infection in many cases was traced to Southern India, but in all probability some cases were connected with the 1910 outbreak. Out of the 58 cases in the Western Province, 49 were treated at the Infectious Diseases Hospital, Colombo. The total number of deaths in which previous vaccination was absent was 23.

Enteric Fever.—614 cases were treated in the hospitals of the Island; 75 per cent. of the total cases were in Government hospitals in Colombo (not including the gaol and municipal hospitals). There were 138 deaths, a mortality-rate of 22·6 per cent. The death-rate in Colombo hospitals was 20·8; there were 20 cases treated in the Kandy hospital, with 2 deaths; 9 cases with 2 deaths at Galle; 18 cases and 4 deaths at Kalutara; 7 cases and 2 deaths at Dikoya; 9 cases with 1 death at Nuwara Eliya. In the eighteen hospitals attached to gaols there were 21 cases, with 5 deaths. The Medical Officer of Health for the suburbs of Colombo reports that the notification of cases of enteric fever is very unsatisfactorily carried out in the villages; notwithstanding, 184 cases were reported to him from between July 1, 1911, and June 30, 1912, and every one was seen by him. Pamphlets were left in all the infected houses with directions as to the precautions to be taken to prevent the spread of the disease. Disinfection of premises was carried out, and free disinfectants issued to the poor.

Dysentery.—This disease is rife in all parts of Ceylon. 4,576 cases were treated in the various Government hospitals, with 1,665 deaths. It is very common in the planting districts and in Colombo. In the former the water supplies are, as a rule, indifferent as to quality and liable to pollution; in Colombo this same cause is found with those who use shallow unprotected wells. But Colombo contains a large number of vagrants, who, as a class, easily contract this disease; 20·53 per cent. of the total treated were in Colombo hospitals.

There were 658 cases with 48 deaths in gaol hospitals; 299 cases with 22 deaths occurred in the Borella civil hospital, 90 cases with 8 deaths in Kandy, and 52 cases with 7 deaths in Jaffna.

Dysentery and diarrhœa are the commonest diseases in our gaols. 2,445 admissions were recorded in gaol hospitals for the twelve months' period, with 125 deaths (5·11 per cent. mortality). In the Colombo gaol hospital alone 758 cases were treated with 57 deaths (7·5 per cent. mortality).

Leprosy.—599 cases of leprosy were treated in the Government medical institutions during the period under review, with a mortality of 49. The present accommodation for lepers is quite inadequate.

The establishment of a leper colony on the island of Mantivu, Batticaloa District, Eastern Province, has been sanctioned. This will provide accommodation for the cases at present at large in the Eastern Province and not segregated, as well as providing for future contingencies.

Anchylostomiasis.—Ordinance No. 9 of 1912 consolidating and amending Ordinances relating to the medical wants of labourers in planting districts, and Ordinance No. 10 of 1912 to prevent the spread of diseases among labourers, were made law during the period to provide for general sanitation on estates; 2,011 deaths were registered from this cause during 1911, which does not include those from the sequelæ of the disease; 4,576 cases of this disease were treated in the Government hospitals during the year. The figures for 1910 were: (1) deaths 1,592, (2) cases treated in hospitals 1910-11 (eighteen months), 8,372.

Diphtheria.—Eight cases were reported, with 5 deaths. In the General Hospital and the Infectious Diseases Hospital, Colombo, 7 cases were treated, with 4 deaths. The other case occurred at Kandy.

Chicken-pox.—1,929 cases of this mild affection were treated, with only 2 deaths.

Parangi or Yaws.—3,335 cases of this disease were treated at the various medical institutions during the twelve months ended June 30, 1912. This number is less than the figure 3,485 given for the year 1909; the deaths for that year numbered 18, and for the present period 43. On account of the discovery of Professor Paul Ehrlich of the preparation salvarsan, or "606," the experiment of effecting improvement by providing a sufficient water supply and wholesome food, to be undertaken at the village Timbirigaswewa in the North-Central Province, was deferred until the results of the injection of salvarsan had been studied. Dr. Aldo Castellani, to whom is due the discovery that parangi is a spirochætal infection, instituted the treatment at the Clinic for Tropical Diseases, Colombo, in November, 1911, and before proceeding on leave reported good results on 12 cases treated. The treatment during the period has been carried on at the General Hospital, Colombo, at Anuradhapura, and at Batticaloa. In these three institutions 54 cases have been treated since November, 1911, and the results to date are uniformly good. No unpleasant sequelæ or visual disturbance followed the treatment. The results show that salvarsan is an effective cure for parangi in every stage of the disease, with the possible exception of cases in which destruction of bone occurs. Cases seen seven months after treatment have shown no tendency to relapse. A more extensive period of observation will determine whether treatment has completely eradicated the disease; and more persistent treatment in cases where bone necrosis has occurred will determine the efficacy or the reverse of the drug in such cases. Further experiments are also indicated in connection with the dosage of the drug. It is pleasant to record that the initial difficulty of obtaining patients to present themselves for treatment is gradually being overcome by the marvellous results obtained in those treated. In Batticaloa and Anuradhapura the drug was injected intramuscularly, and in Colombo intravenously. It is in contemplation to extend to other stations facilities for this treatment.

Cancer.—Under this heading 394 deaths were registered in 1910, as against 158 in 1909. From these figures it cannot be said definitely that the disease is increasing in this country, because the attention of medical practitioners has been directed to the subject through many channels, notably through the reports published from time to time by the Cancer Research Fund, and these reminders may have influenced the correctness of diagnosis, which would increase the number of deaths certified.

Turning to the records of the hospitals, it is seen that the reports on the number of cases of cancer (*i.e.*, carcinoma and sarcoma together) in 1911-12 were 221, as compared with 121 in 1910-11.

Of these 5 sarcoma and 133 carcinoma cases were treated in the General Hospital, Colombo. Of the sarcomata 6 occurred in bone, 2 in the eye, and 1 in the parotid gland. The carcinomata were distributed through the various parts and organs of the body.

Phthisis.—In the Registrar-General's returns for 1911, 4,286 are shown under the heading "Phthisis," as against 3,917 in the year 1910. During the twelve months' period there were 1,652 cases reported from the hospitals. In these reports the notified cases registered at the Municipality are not included.

Since the publication of the last Administration Report, the antituberculosis campaign has not progressed very rapidly, but a site for a tuberculosis dispensary has been chosen in a central part of the city of Colombo, and 40 acres of land given by Mr. A. E. de Silva for a sanatorium have been taken over by Government. Arrangements are now in hand to start the dispensary building as soon as the plans, &c., are approved. The amount, with interest, of the Antituberculosis Fund subscribed to by the public now stands at Rs. 179,737. Mr. and Mrs. J. N. Campbell's donation of £10,000 is not included.

Vaccination.—During the period under review 161,979 subjects were vaccinated, of which 134,432 were primary vaccinations and 27,547 revaccinations. Of the former, 111,947 were successful and 11,900 unsuccessful; in 10,585 subjects the results of the vaccination were not known.

The percentage of successful cases to the total inspected was 90·39. For revaccination cases 13,677 were successful and 5,598 unsuccessful; in 8,272 the results were not known. The percentage of success in the revaccinated was 70·95. The number vaccinated in the twelve months' period is smaller actually and relatively than the figures of 1909. The successes are less in primary vaccinations, but the same in the revaccination returns. The quality of the lymph has been greatly improved; bacteriological examination at the time of collection showed the number of extraneous micro-organisms to be normal.

The buildings and equipment of the vaccine establishment have been much improved by the addition of a new office, operating-room, and lavatory, by new stalls, and the fly-proofing of the rooms and stables.

The calves were not always of good quality and physique, and owing to the large amount of small-pox in parts of the island the number necessary could not always be obtained. This difficulty was got over by the foresight of the officer in charge, who had a good supply of lymph in cold storage; 498 calves were employed for the manufacture of lymph, and 82,695 tubes of lymph were issued from the establishment.

Precautions taken against the Introduction of Infectious Diseases.—During the twelve months' period the medical staff at the port consisted of the port surgeon and three assistants; one clerk added. The total number of vessels calling at Colombo was 3,155 steamers and 403 Indian and native sailing vessels.

The following ports were declared infected: Bombay, Calcutta, Rangoon, Burma, Karachi, Tuticorin, Mangalore, Madras, Calicut, Tellicherry, Bangkok, Batavia, Sourabaya, Samarang, Mauritius, Port Said, Hong Kong, and Penang.

The number of vessels placed in strict quarantine was: For plague, 4; suspected plague, 3; small-pox, 3; cholera, 2. 1,210 vessels arrived from infected ports, and being "healthy" were permitted to work cargo as "healthy in quarantine."

Plague.—Three infected vessels were dealt with:—

(1) ss. "Tonkin," from the Far East, on July 1, 1911, with a first-class European passenger. He was landed at Galle with contacts and the vessel returned to Colombo.

(2) ss. "Patrician," from Calcutta, on April 23, 1912, sent to Galle. Six cases of plague occurred with three deaths. Vessel proceeded to Trincomalee and then returned to Colombo, where she was disinfected.

(3) ss. "Kybfele," landed a case of plague at Bassein within ten days of her arrival here.

(4) The following ss. "Nubia," "Fulwell," and "Karembi," were suspected. The bacteriological examination was negative.

The prevalence of cholera and small-pox in the south of India gave rise to much anxiety, because there are a large number of native passengers arriving here daily. Towards the end of 1911 Tuticorin, the principal port on the Indian side, became infected, and remained foul for many months.

The total number of estate coolies arriving at Colombo was 111,783, and 51,248 "miscellaneous deck passengers"; of the latter, 4,139 persons were vaccinated on arrival. The estate coolies showing no marks of vaccination or of small-pox are vaccinated at the cooly camp at Ragama.

Lunacy.—The total number of patients treated in the Colombo Asylum during the twelve months' period was 1,075 (males 690, females 385). The number discharged was 248 (males 182, females 66). The number of deaths was 70 (males 41, females 29). In the House of Observation 228 persons were treated (159 males and 69 females), of whom 100 (males 58, females 42) were transferred to the asylum, and 116 (males 93, females 23) were discharged. The accommodation provided at the asylum is inadequate for the numbers treated.

Meteorological Conditions and their Relationship to Disease.

The rainfall map shows the driest districts to have been Delft and Kayts in the north, Mannar and Puttalam in the west, and Hambantota in the south.

The most noticeable feature of the period was the heavy rainfall in November and December, 1911, which has had the effect of bringing the total for the year above the average in the north and east part of the Island.

The central and south-western parts of the Island showed the heaviest rainfall—in the former principally in a belt extending from Topawewa in the north to Kohonella in the south and in the latter from Avisawella in the north to Baddegama in the south.

The influence of the two monsoons on the

incidence of malaria has been previously noted, occurring, as it does, chiefly after the first rains of the monsoon. It also occurs in severe form at the end of a long drought after light showers.

Respiratory diseases are common in the hilly districts and elsewhere during the north-east monsoon due to the cold nights and early mornings. Intestinal diseases are very common during the rains and also depend on meteorological conditions. Rheumatism and allied conditions show a marked increase at the beginning and end of the monsoons, and this is attributed to the sudden fall of temperature incidental to these periods. Conjunctivitis and other eye affections are prevalent during the high winds of the monsoon, and are attributed in some measure to dust and sand being blown about.

General Sanitary Condition of the Colony and of the Chief Towns.

The general sanitary condition of the Colony shows little improvement. With the exception of towns where there is a municipality or local board, very little attention is devoted to sanitation, and even municipalities and local boards have their sphere of action curtailed by lack of funds and an inadequate staff. In a large number of towns conservancy is of the most primitive kind, drainage is absent or markedly defective, water supply is unsatisfactory, and disposal of refuse haphazard. On the whole progress is exceedingly slow.

Colombo.—A new main was laid which has had the effect of increasing the water supply to Maligakanda reservoir by 27 per cent., and 7,210 lineal yards of extension of city mains were completed; 289 new connections were made. The new main above mentioned has rendered a constant supply available to all parts of the city for the current year, and further progress will be made to extend the new main from Labugama. Considerable progress was made in extending areas sewered and drained; as well as in houses and premises drained and connecting them to main sewers. A new water-carriage latrine and bathing system on Lotus-pond was completed, and three others were initiated during the year. The housing problem has become very acute. The state of the market is highly unsatisfactory, but there has been an improvement in the dairies. There was a considerable increase in the number of infectious diseases notified, due to phthisis having been made notifiable and to hitherto undefined fevers being properly classified as enteric, which latter shows an increase from the previous year.

The average birth- and death-rates per 1,000 of the population for 1911-12 were 24·7 and 33·8 respectively.

The Rural Medical Officer reports the occurrence of 184 cases of enteric fever, 14 of small-pox (5 in contacts under segregation), 87 of measles, and 159 cases of chicken-pox. A few cases of diarrhœa and dysentery occurred, but never in an epidemic form.

Kandy.—Water supply was constant throughout the year, in spite of a prolonged drought. Cement concrete side drains were extended and some of the old brick drains were replaced by cement concrete. Paving to the bed of the Meda-ela was extended. There was no special mosquito brigade, but all necessary measures to prevent mosquito breeding it is said were adopted by the Health Department of the Municipality.

Galle.—The limits of the town have been enlarged and the water and lighting services extended. A beginning has been made to put up new latrines of modern type, which will be provided with water from the main. Extension of cement drains is proceeding slowly as funds permit. Scavenging of the Fort by the Council is satisfactorily carried out, but outside, where the work is done by a contractor, it is unsatisfactory. A scheme for further improving the sanitation of the town is under the Council's consideration. Overcrowding occurs in parts. Water supply is plentiful, but the better classes prefer to buy water on account of the rusty discoloration of the town supply. The water, however, has been analysed and declared to be of good drinking quality. The mosquito brigade has been discontinued by the Council, as they consider that the people have been sufficiently instructed to prevent mosquito propagation and should carry out the necessary work themselves.

Jaffna.—Sanitary improvement is slow owing to lack of funds. Drainage is entirely surface, and the drains need grading. Cement drains are required. The paddy fields in the town are gradually being filled up and dwelling-houses erected on them.

The number of public latrines is inadequate, and many of the poorer and most crowded parts have no provision made for them; consequently they use the culverts and foreshore. The water supply is entirely from wells.

Batticaloa.—Drainage is very unsatisfactory, both as regards outlets for storm water and house drainage. Even small showers cause pools and puddles which breed countless mosquitoes. Water is too scarce for drain flushing purposes, and the masonry drains in the town suffer in consequence. Water supply is from wells yielding brackish water. A water supply scheme is in contemplation, the water being brought in pipes from wells near the Bar. Scavenging is unsatisfactory on account of the insufficient number of men employed for the work. Public institutions, five public latrines and the better class bungalows employ the dry-earth system with removal by boat for burial on the west shore of the lake; the conservancy consists of cesspits with considerable surface pollution. Slaughter-houses and bakeries are well kept, also the public markets. Cattle galas are often dirty and insanitary.

Anuradhapura.—Drainage is satisfactory. Market place and principal streets have well-built cement side drains. A scheme is in operation to still further extend the surface drainage. Water supply is from wells, it is hard. That from the Tissawewa tank is soft and not above suspicion. Scavenging is satisfactory, cement receptacles are provided in all the principal streets and markets, and the sweepings are carted away and buried about a mile from the town. Excreta from public latrines and private houses is removed in iron carts and buried outside town limits. Latrines are well supplied with dry earth and disinfectants. Laundries, dairies, and bakeries are well kept and daily inspected.

Colonial Medical Reports.—No. 53.—Ceylon (*continued*).

Kurunegala.—Drainage is defective, more built drains are required, and several low-lying swamps require to be drained. Water supply from wells is unsatisfactory. A scheme to provide a pipe-borne supply is under consideration. Scavenging and disposal of sewage is fairly satisfactory. Conservancy is of the dry-earth system in better class houses, and cesspits are being gradually suppressed. The condition of the various public latrines under the local board is not satisfactory: they require more supervision. Bakeries, laundries, public markets, and dairies are fairly well kept. Overcrowding exists in several parts of the town. An anti-malarial campaign under the care of Dr. Gunesekera was initiated in September last and has so far resulted in considerable mosquito reduction. It is hoped that in next year's report statistics as to case incidence will be available.

Badulla.—The cement surface drains are being gradually extended so as to include the whole town. The water supply is good and ample. The existing public latrines are insufficient to meet the public demand. Scavenging is satisfactory. Bakeries and public markets are well kept. A small gang is engaged in anti-malaria measures under the direction of the provincial surgeon.

Ratnapura.—Sanitary condition is fair. Drainage is defective and requires urgent and early attention. Water supply is from the town reservoir; there was no shortage this year on account of the continuous rains. Overcrowding is very noticeable, especially since the railway was opened.

GENERAL.

Medico-legal.—During the period under review the Government Analyst completed 317 reports; 782 samples were examined in connection with them. The total number of judicial cases was 231, involving the examination of 592 productions. There were 71 cases of suspected poisoning; 122 samples of medicines were sent by the courts for reports. Besides criminal productions, 110 samples were reported upon for various departments of Government. Examinations for opium and ganja, 31 cases, 101 productions; blood and other stains, 108 cases, 289 productions; miscellaneous, 21 cases with 42 productions; Customs, 80 samples.

Administrative: Hospitals, Asylums, and Dispensaries. These institutions have been well maintained and many improvements have been carried out, particularly as regards fly-proofing, drainage, and water supplies. The new out-patient department building in the General Hospital, Colombo, was completed and opened in April, 1912. There were 77 hospitals as well as the lunatic and leper asylums, 418 Government dispensaries, and 279 estate dispensaries.

Nursing in Ceylon Hospitals.—This is undertaken by qualified European trained nurses, religious sisters, and locally-trained Ceylonese young women. There are 20 European trained nurses (there will be an addition of one for the General Hospital, Colombo, next year), 37 religious sisters, 33 locally-trained matrons, 39 locally-trained nurses, and 35 pupils in training. As the inducements offered to trained matrons and nurses were not sufficiently attractive, as shown by the fact that provision is made for 44 trained matrons and 86 nurses, while the highest numbers available at any one time are as shown above. The emoluments and conditions of service were improved. Male and female attendants assist the nurses in the wards.

Number of In-patients treated.—The total number of in-patients treated in all the hospitals and asylums of the Island was 91,443. The deaths were 9,949, giving a death-rate per cent. of 10·88 of the hospital population.

Number of Out-patients treated. — At the 418 Government dispensaries 1,876,795 new cases were treated, who paid 2,866,962 visits.

Surgical Operations.—3,492 operations in general surgery were performed in all the hospitals, with 133 deaths, a death-rate of 3·75 per cent. Operations on the eye, ear, throat, and nose not included in the above, numbered 724 among out-patients and 352 among in-patients, total 1,076 (at the Victoria Memorial Eye Hospital). This latter shows an enormous increase in the out-patient department, the number of out-patients operated on in the previous eighteen months being 604.

General Hospital, Colombo.—On June 30, 1911, there were 585 patients left in hospital, 45 in the paying section, and 540 in the pauper. During the twelve months under review 15,764 new cases were admitted, making a total of 16,349 cases under treatment. Of the 15,764 new cases, 848 were admitted to the paying section and 14,916 to the pauper. Of the 16,439 cases under treatment 14,095 were discharged, 1,677 died, and 577 were left in hospital on June 30, 1912—40 in the paying section and 537 in the pauper.

The maximum number of cases in hospital on any one day was 644 in the pauper section on January 3, 1912, and 52 in the paying section on July 12, 1911. The minimum number of cases in any one day was 503 in the pauper section on April 14, 1912, and 26 in the paying section on March 14, 1912.

1,874 surgical operations were performed with 69 deaths—a mortality of 3·6 per cent. Of these, 108 (4 died) were performed in the paying section and 1,766 (65 died) in the non-paying section.

The temporary closing of the convalescent hospital at Ragama in May, 1911, led to the necessity of the erection of four cadjan sheds in the grounds of forty beds each. There has been considerable trouble and danger with these sheds on account of the roofs blowing off and consequent exposure. They are difficult to keep clean, and it is advisable to make provision for permanent buildings, the cost of which would not be so great as the amount already spent. The diarrhœa wards were fly-proofed and the pauper section main kitchen was fitted with cooking ranges and boilers aud fly-proofed.

Houses of Observation for Suspected Lunatics.—In addition to these admitted into the Houses of Observation at the Colombo Lunatic Asylum, the numbers admitted into those at Kandy, Galle, and Jaffna were 40, 64, and 13 respectively.

De Soysa Lying-in Home.—The numbers treated in this institution go up each year. For the twelve

months' period 1,356 were treated, of whom 35 died (2·5 per cent.) Of the deaths, 16 were due to accidents of childbirth; of the number admitted 1,049 were before delivery, 64 after, and 243 before the commencement of labour. Only one case of tetanus has occurred in the last ten years.

The seriousness of labour cases complicated with anchylostomiasis is shown by the fact that 7 out of 19 cases died. The percentage of infantile mortality was 5. It is gratifying to note that 28 patients were Muhammadans.

The Lady Havelock Hospital for Women and the Lady Ridgeway Block for Children.—The number of patients attending at the out-door dispensary (in association with the Lady Havelock Hospital) was 25,998. During the period under review 942 patients were treated in the Lady Havelock Hospital, with a death-rate of 6 26 per cent. The number of Muhammadans treated was 33. There were 71 surgical operations performed, with 4 deaths.

In the Lady Ridgeway block from July 1, 1911, to June 30, 1912, 828 children were treated, of whom 194 died, a mortality of 23·4 per cent. This high death-rate is due to the fact that parents will not bring the children early in the disease; often they are dying when admitted, and frequently cases are treated for weeks by vedaralas before seeking admission. This institution is very popular, the number of applicants seeking admission often exceeds the number of vacant beds.

The Victoria Memorial Eye Hospital and Grenier Outdoor Dispensary.—At the dispensary 9,784 new cases (eye and ear) were treated, among which were 1,237 cases of injury; 175 persons were examined as to their fitness for employment in government departments, *e.g.*, the railway; 724 operations were performed.

At the Victoria Memorial Eye Hospital 888 in-patients were treated; 352 major operations were performed, 232 of which were for cataract. To show the popularity of this institution, patients came from every Province in this Island and from South India. The accommodation provided has been found insufficient. A new male ward is in course of construction out of funds generously given by Mr. Walter de Soysa, who has donated Rs. 50,000 for the extension of buildings for the treatment of eye diseases in Colombo, Galle, and Kandy.

Police Hospital, Colombo.—The total number of patients was 1,389. Of those admitted two died, both from pneumonia; only one case of enteric fever was admitted. There were 200 cases of influenza, The average daily sick in hospital was 27·42.

Branch Hospital for Women.—At Colombo 399 were treated for venereal diseases, with 4 deaths. At Galle 99 were treated, with no deaths.

At the *Female Outdoor Dispensary at Borella* 587 cases were treated.

Jail Hospitals and Sick Prisoners.—During the twelve months' period 15.660 prisoners were admitted into the different jails of the Island. The average daily strength of prisoners was 2 998·24, the number treated in jail hospitals was 4,996, the total number of deaths was 268.

The chief causes of sickness and deaths were as follows: 1,787 cases of diarrhœa, with 77 deaths; 658 cases of dysentery, with 48 deaths; 921 cases of malaria, with 21 deaths; 21 cases of enteric fever, with 5 deaths. All other diseases totalled 1,261, with 85 deaths.

Diets.—In August, 1910, 16 oz. of raw rice was substituted for 16 oz. of bread in No. 1 penal diet in the Colombo prisons.

Kanatta Infectious Diseases Hospital.—705 cases of infectious diseases were treated at the hospital during the twelve months' period.

Victoria Home for Incurables.—At this institution 74 remained on June 30, 1911, and 7 were admitted during the period under review, making a total of 81 cases, of whom 1 was discharged and 2 died, 78 remained on June 30, 1912.

Bacteriological Institute and Clinic for Tropical Diseases.—The total number of specimens sent for bacteriological examination was over 1.500. The fees collected amounted to Rs. 625·50. A new clinic is an urgent need, the present building being unsuitable. Research work was carried out in the following subjects by Dr. Castellani:—

(1) Dhoby itch and its fungi (five new species).

(2) The hyphomycetes of *Tinea imbricata*; their growth on artificial media and experimental reproduction of the disease.

(3) Copra itch.

(4) Intestinal flora in cases of diarrhœa alba.

(5) Fungi of the genus endomyces.

Hospital Accommodation.—This was generally sufficient. Some of the hospitals in the planting districts were overcrowded. Water for drinking purposes is, as a rule, filtered before use. Separate bathrooms are provided for males and females, but patients who can help themselves prefer to bathe in streams when such are near. The conservancy of the latrines is entirely on the dry-earth system, and the latrines are fly-proofed. The hospitals and dispensaries were regularly inspected by myself and the provincial surgeons of the respective provinces.

Food Supply. The provisions for the various hospitals were supplied by contractors approved by Government. The system works satisfactorily. The food is inspected by the medical officers of the hospitals before it is served to patients, and any samples not approved are rejected. Contractors offering inferior samples are fined.

The Ragama Camp. The total number of persons that passed through the camp during the period under review was 103,670. Of these, 398 were from cholera-infected areas, 100,985 from cholera and smallpox areas, 2 104 from smallpox-infected districts, and 124 from plague-infected parts; and the others were wharf coolies. The port surgeon and medical officer of the camp vaccinated 34,395 persons who showed no marks of previous vaccination or smallpox.

Medical College. The College consists of lecture hall, students' library, laboratories for chemistry, physiology, and biology, a dissecting room, offices, photographic rooms, museum, the Colonial Medical Library, and a separate building for lady students. There were 232 students in attendance at the end of June last, of whom 151 were registered medical students and 81 apothecary students; 9 students

qualified in medicine and surgery; 16 apothecary students passed out.

APPENDIX.

Opium.

Since the previous report there has been an amending Ordinance, No. 17 of 1911, which came into force on May 17, 1912. Its provisions are as follows:—

(1) Empowers senior medical officers of this department to exempt medical prescriptions for opium from the limit of three days' supply imposed by the first Ordinance.

(2) Enables a planter who has no dispensary on or near his estate to issue three days' medical supply of opium to an immigrant cooly.

(3) Empowers Government agents to cancel a consumer's certificate if he has been convicted of any offence under the Opium Ordinance or rules.

The number of depôts has been reduced from 58 to 55. The staff at the depôts consists of 8 clerks and 24 sellers, and in addition an allowance is paid to 27 apothecaries for doing the work at depôts where there are no sellers. Three inspecting clerks are employed entirely in visiting and checking the depôt stocks and accounts. Depôts are also occasionally visited by inspecting medical officers, provincial surgeons, and others.

A fresh set of rules under the Ordinance was drawn up and published in June, 1912.

A statement of the opium sold and the amounts realized during each quarter of the year to September 30, 1912, is appended. It will be noticed that the total for the year exceeds that of the previous year which is inserted for comparison.

The figures show an increased consumption of 4,335,209 gr. of eating opium, but the consumption during the first three quarters after the start of the system, *i.e.*, to June 30, 1911, was under the average of subsequent months. The highest consumption of eating opium for any one quarter since the start of the system was for the quarter to December 31, 1911, viz., 16,616,285 gr. It will be noticed that the figures have since declined.

The sales of smoking opium show a slight increase in the last half year. Consumers have the option of taking either eating or smoking opium, and where the difference in expense is no obstacle and the morphine strength the sole desire, there may perhaps be a tendency to buy smoking opium even for eating purposes, because its morphine strength is greater than that of eating opium.

It has been the practice of Government agents to increase the original allotments to consumers, but this has now been stopped.

The retail price of the opium is the same, viz., 1 cent per gr. for smoking, and ¾ cents per gr. for eating opium.

The sale of opium (medicinal preparations) from the start of the system has been as follows: Period to June 30, 1911, Rs. 3,228·28; to June 30, 1912, Rs. 6,887·63.

A. Perry,
Principal Civil Medical Officer and Inspector-General of Hospitals.

Statement of Opium sold and the Amount realized during the Year October 1, 1911, to September 30, 1912.

During the Quarter ending	Eating: Quantity sold Grains	Eating: Amount realized Rs. c.	Smoking: Quantity sold Grains	Smoking: Amount realized Rs. c.	Total realized Rs. c.
December 31. 1911	16,616,285	125,122 61	2,983 309	29,833 5	154,955 66
March 31, 1912	16,290,432	122,580 87	2,970 465	29,705 24	152,286 11
June 30, 1912	16,027,254	120 568 4	3.012.350	30,123 50	150,691 54
September 30, 1912	16,137,797	121,394 88	3,042,444	30,424 44	151,819 82
Total for the year to September 30, 1912	65,071,768	489,666 40	12,008,568	120,086 23	609,752 63
Total for the year to September 30, 1911	60,736,559	457,280 40	12,206,574	122,096 40	579,376 80

Colonial Medical Reports.—No. 54.—Calcutta.

REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR THE YEAR 1911.

By T. FREDERICK PEARSE, M.D., F.R.C.S.Eng., M.R.C.P.Lond., D.P.H.Cantab.

Comparing the meteorological conditions of 1911 with those of the previous year, all we have to note is that there was less humidity in the first three months and in the latter half of the year, and that the rainfall was markedly less during the monsoon period. The average temperature was less in January and during July, August and September, but during the remainder of the year was practically the same as in 1910. On the whole, the conditions were favourable.

The Census of 1911.

Since the last report, the Census figures have been revised. Calcutta has now a population of 896,067. This is 5,574 more than given in the provisional figures. The alterations affect many areas and shows an addition of 6,697 males but a diminution of 1,123 females.

The old city has now a population of 585,845—an increase of 8,779, and the suburban wards 266,163 as compared with 225,367 in 1901. The suburban wards have thus increased by 40,796.

For the whole city there has been an increase of 45,078 males but of only 3,193 females.

We notice the great increase of males. Large numbers of the young men who come into the city at ages 20-25, 25-30, 30-35, for work evidently remain for several years, because we find that at ages 35-40 and 40-45 there are more males than were recorded for the ages 10-15. We may take it, as a rule, that without immigration into the city the numbers of males would regularly decrease with each successive five-yearly period of age. Further we find a sudden drop in numbers at ages 45-50 and 50-55. This must mean that at these ages a large number of men must leave the city, as the difference cannot be accounted for by deaths.

On the female side, on the contrary, we find no such sudden increase of numbers, but there is evidently some immigration of women into the city at ages 15-20 and 20-25.

The males exceed the females at all ages, but the great disparity in numbers begins at ages 10-15 and continues up to about 60 years of age. It is worth noting that 52·3 per cent. of the total female population are of ages 15-45 years, whereas of the total male population no less than 68·5 per cent. are between these ages.

Vital Statistics.

(a) *General Considerations.*

The year has been a very healthy one and the death-rate is the lowest ever recorded. Calculated on the Census population of the year, the mortality gave a ratio of 27·2 per 1,000. The Census having taken place during the year, there is no allowance to be made, as in the previous years, for increase of population. The average annual death-rate for the past five years was 32 per 1,000. Corrected, however, for increase of population since 1901, the rate for 1910 should have been 26·6 per 1,000. The slight increase in the number of deaths during 1911 was chiefly due to the larger plague mortality, although there was also an increase under some other heads. The average weekly number of deaths in Calcutta during the past five years has been 523, but during the past year the average was 469. This comparison implies a saving of 2,808 lives during the past year. Of the total number of deaths, no less than 14·9 per cent. was due to cholera, small-pox, and plague. The proportion, however, is small compared with the average of the past five years. We find that the mortality is greatest in the winter months and least during the months of the monsoon, and that the rise and fall of mortality is steady between the periods. Large numbers leave the city before the monsoon to return to it during the winter.

I draw attention to the fact that the mortality in the old city was less than in 1910, while that of the suburbs was greater. These were distributed over the several wards and were occasioned chiefly by plague, dysentery and diarrhœa, but also by cholera and "other causes."

The high mortality amongst females is as remarkable as in previous years. This peculiarity applies to all districts.

It is worth noting that females have a higher mortality than males from "fevers," dysentery, diarrhœa, respiratory diseases, measles and chicken-pox, and from "other diseases."

Births and the Birth-rate.

The total registered births amounted to 19,515 as compared with 17,106 in the previous year, and the birth-rate was 21·7 per 1,000 of the population. The number of births was the highest that has ever been recorded for the city. During the whole of the year the vaccinators have acted as peripatetic birth sub-registrars in addition to their other duties—the old peripatetic birth sub-registrars having been discharged. The system has apparently worked well. From October last the vaccination stations have been converted into birth registration offices and have been open every day instead of on alternate days as formerly. This has proved of great convenience to the public not only for purposes of vaccination, but also for birth registration. I do not pretend that the organization is complete, or that birth registration is perfect, but the results are better. The combination of the work of vaccination and birth registration in one officer promises well.

Colonial Medical Reports.—No. 54.—Calcutta (*continued*).

It is not only satisfactory to be able to record an increase in the general birth-rate but also an increase in each district. We find also that nearly every ward in the city shows an increase. This is proof that the present system of registration of births is an advance on any previously adopted.

Infantile Mortality.

There were 4,911 deaths of infants during the year, giving a rate on the total of registered births of 251 per 1,000. This is the lowest rate for over twenty years. This compares favourably with the rate of 273 per 1,000 during the previous year. The difference in the rate, however, is brought about not by a diminution of infant deaths, which were 232 in excess, but by the large increase of registered births. Last year, as I pointed out, registration of births was defective.

Prevalence of Epidemic Diseases.

The city suffered considerably less from epidemic diseases than in previous years.

There were only 41 deaths from small-pox, and only 88 from measles. The small-pox deaths occurred in the first half of the year—only one death being reported after June 30. On the other hand, there were 1,736 deaths from plague as against 1,262 in the previous year. Plague occurred almost entirely in the months of March to July, but deaths were reported for every week in the year. The mortality from cholera (1,860 deaths) was slightly less than in 1910. Cholera was most prevalent in the months of March, April and May, but a small outbreak occurred in October and November. No month showed less than 55 deaths. The death-rate from malaria was less also. There were rather more deaths, however, from "other fevers," from dysentery and diarrhœa, and from tubercular diseases. The deaths from beri-beri were only 20 in number. This fall from the high mortality of 1909 is sufficient of itself to refute the peculiar food theory advanced for the causation of this disease. There is no evidence that the diet of the people has been changed and milling of rice goes on exactly as before.

Cholera.

There were 1,860 deaths from cholera during the year. This is the smallest mortality recorded for the past ten years. Every now and then small outbreaks occur in bustees, and almost invariably round or near to a tank. Prompt measures succeed in checking the spread. Males and females are equally attacked.

There are no particular meteorological conditions recognizable as associated with the incidence of this disease.

Plague, 1911.

Plague was more severe and extensive in Calcutta during 1911 than in the previous year. The return shows 1,851 cases with 1,736 deaths—a case mortality of 93·8 per cent. and a death-rate on the total population of 1·9 per 1,000.

There were 28 deaths amongst imported cases.

As usual the recrudescence began in January, developed in February and March, and attained its acme in April, from which date it declined steadily until August, when the quiescent period commenced and continued for the remainder of the year.

There was no death from plague reported amongst persons previously inoculated, but a rat inspector and a disinfecting coolie died from plague. Rewards have continued to be offered for rats, and 119,728 have been received and destroyed. In addition 17,088 rats were found dead in the streets. A few huts, where several cases of plague occurred, have been demolished and compensation paid to the owners.

The bubonic form of plague forms about 45·3 per cent., whereas the pneumonic form, which was so fatal during the year in Manchuria, only constituted 1·5 per cent. of the cases.

The ratio of bubonic cases increases with the advancing epidemic, attains its height at about the same time or a little after the period of the maximum of cases, and declines with the reduction of cases. When plague is raging, nearly half the cases are of the bubonic variety, whereas when the disease is quiescent less than 30 per cent. are bubonic cases.

Small-pox.

There were only 41 deaths from small-pox during the year. This is the smallest mortality since 1892, and with the present larger population gives the lowest death-rate (0·04 per 1,000) for over twenty years. All these deaths, except one, occurred in the first six months of the year. They were scattered all over the city. Females were attacked in twice the proportion to males. Four deaths occurred amongst infants.

Vaccination.

The number of vaccinations performed during the year was 32,936. This is an improvement on the previous twelve months by 8,677. Of this number 26,715 were primary vaccinations (as against 20,561 for 1910) and 6,221 were re-vaccinations. Of the primary vaccinations 26,510 were successful, giving a percentage of 99·2. Of the re-vaccinations 1,872 were successful, giving a percentage of 36·5.

The new Vaccination Act only came into force during the year (April 1, 1911).

The important changes were :—

The inspectors of vaccination are now recognized officers and have had certain definite functions assigned to them.

For the convenience of parents and guardians vaccinated children may be brought for inspection "a day not less than seven or more than ten days" after vaccination.

Children must now be vaccinated within six months of birth (if born in Calcutta) or within six months of coming to reside in Calcutta.

Certificates of unfitness of vaccination now remain in force for one month only.

During the year the system of making the vaccinators do double duty, viz., as vaccinators and as Peripatetic Birth Sub-Registrars has been in force. In addition from October 1, the Vaccination Stations have been opened daily from 7 to 10 a.m., instead of on alternate days as formerly, and these stations are now also used for birth registration. There are 13 vaccinators who do duty at these

stations, *i.e.*, vaccinate at the stations and register births, the remainder of the staff of vaccinators doing duty in the homes. The system seems to be working well and the facilities for vaccination are now very great. Any one can be vaccinated at any station on any day of the week.

The Animal Vaccine Depot.

In order to be ready for emergencies, a larger quantity of vaccine lymph was prepared during the year. By keeping the lymph purifies without losing its specific properties.

Nomenclature of Diseases and Deaths therefrom during 1911.

(1) *Acute Specific Diseases—*	
Cholera	1,860
Small pox	41
Plague	1,736
Measles	88
Influenza	4
Enteric (or typhoid)	343
Remittent fever	835
Cerebrospinal meningitis (epidemic)	26
Acute pneumonia	630
Diphtheria (and croup)	53
Erysipelas	48
Septicæmia and pyæmia	26
Acute rheumatism (rheumatic fever)	74
Dysentery	1,601
Beriberi or epidemic dropsy	20
Hydrophobia	9
Tetanus	1,143
Syphilis (*a*) Acquired	24
Syphilis (*b*) Congenital	25
Tuberculosis (*a*) Phthisis	1,977
Tuberculosis (*b*) Other forms (tabes scrofula)	83
Leprosy	106
Other and rare fevers (fever, whooping-cough, relapsing fever, scarlet fever, glanders, anthrax, typhus, &c.)	423
(2) *Parasitic Diseases—*	
Malaria (and intermittent fever) and ague	1,293
Tropical cachexia (kala-azar)	38
Elephantiasis	2
Other parasitic diseases (worm, &c.)	1
(3) *General Diseases—*	
Cancer	98
Diabetes	102
Rickets	14
Chronic rheumatism	4
(4) *Development Diseases—*	
Premature births	457
Debility at birth	843
Wasting and marasmus (malnutrition)	35
(5) *Old Age*	1,256
(6) *Poisons—*	
Alcoholism	4
Drugs (not suicide), cocaine, morphia, &c.	3
(7) *Diseases of Digestive System—*	
Gastritis (*a*) Acute	21
Gastritis (*b*) Chronic	68
Diarrhœa and Intestinal catarrh (*a*) Acute	141
Diarrhœa and Intestinal catarrh (*b*) Chronic	196
Enteritis (*a*) Acute	280
Enteritis (*b*) Chronic	43
Appendicitis	11
Hernia (and intestinal obstruction)	60
Hepatitis and cirrhosis	57
Abscess of liver	233
Infantile liver	686
Peritonitis	29
All other diseases of digestive system	55
(8) *Respiratory System—*	
Laryngitis and œdema	4
Bronchitis (*a*) Acute	2,015
Bronchitis (*b*) Chronic	1,389
Asthma and emphysema	126
*Respiratory System—*Contd.	
Broncho-pneumonia	563
Pneumonia, Chronic	68
Pleurisy (all forms)	23
Other diseases of system	5
(9) *Diseases of Circulatory System—*	
Valvular disease of heart	13
Angina pectoris	7
All other diseases of the heart	318
Aneurysm	6
Other diseases of blood-vessels	60
(10) *Diseases of the Nervous System—*	
Insanity (all forms, including general paralysis)	17
Diseases of spinal cord (paraplegia, &c.)	24
Meningitis (not cerebrospinal)	38
Hemiplegia	158
Apoplexy	133
Convulsions (not puerperal)	97
Epilepsy	16
All other diseases of nervous system	48
(11) *Diseases of Locomotive System* (arthritis)—	
Diseases of bones, joints, and muscles	9
(12) *Diseases of Urinary System—*	
Acute nephritis	9
Chronic nephritis (and Bright's disease)	118
Diseases of bladder	4
Calculus (stone)	11
Other diseases of urinary organs	64
(13) *Diseases of Generative System—*	
Diseases of uterus, ovaries, &c.	7
(14) *Diseases of the Blood and Ductless Glands—*	
Anæmia	18
Diseases of spleen	32
,, lymphatic glands	1
,, thyroid	3
Other diseases of blood, &c.	7
(15) *Diseases of Skin and Connective Tissues—*	
Abscess	44
Ulcer	65
Carbuncle	14
Cellulitis	26
Gangrene	33
Other diseases (cancrum oris, &c.)	17
(16) *Diseases of Child-bed—*	
Puerperal fever	247
,, convulsions	7
,, diarrhœa (*sutika*)	120
Abortion and miscarriage	4
Childbirth	96
(17) *Accidents—*	
Gun-shot	3
Wounds	6
Burns and scalds	83
Drowning	44
Snake-bite and wild animals	4
Other accidents (falls, &c.)	242
(18) *Various* (unclassified)—	
Sunstroke (and heat-stroke)	3
Suicide (all forms)	70
Murder	4
Execution	1
Tumours	35
(19) *Ill-defined and unknown*	627

There was at all times a sufficient supply, not only for the Vaccination Department, but also for the public, and a reserve was always available for at least 40,000 vaccinations. Above all, however, it is satisfactory to record that the lymph was undoubtedly good.

Measles.

This disease has been less prevalent during the past year—88 deaths only having been recorded as compared with 240 in 1910. As in the previous year, the disease occurred chiefly in the first five months and was proportionately greater amongst females. Fourteen of the deaths occurred amongst infants.

Enteric Fever.

This disease caused 343 deaths—a slight excess over the previous year. It is probable that many deaths returned as due to other fevers are really occasioned by this disease. More careful and detailed inquiries are now made than formerly, and more deaths from enteric are found out. This by no means implies that the disease is on the increase. There was a time when it was thought that enteric fever did not occur amongst the natives of India, but this is now admitted to be incorrect. A more careful study will enable the disease to be recognized, and we may expect that future returns will show more and more deaths as due to this disease. In London the death-rate is 0·04 per 1,000, but for Calcutta the rate last year was 0·38 per 1,000.

We may call this disease essentially endemic. It occurs all through the year, but there are more deaths in the latter half.

Diphtheria.

This disease caused 50 deaths—a few more than in 1910. It chiefly affects the northern half of the city. Females suffered to twice the extent of males. The deaths were distributed throughout the year.

Epidemic Dropsy.

(*Beriberi.*)

There were only 20 deaths reported as due to beriberi during the year. No fresh cases came to my notice, and these deaths were apparently all due to the long-standing sequelæ of this disease. There are some who still hold to the extraordinary theory that this epidemic disease is brought about by an imperfect dietary—a dietary in which rice forms the principal part and in which the rice has been deprived of valuable constituents by polishing. Attempt is even made to show that the disease occurs in times of a high and sustained rise in the price of good grains. In reply it is sufficient to say that the character of the food of the people has remained the same for generations, and that rice, the principal constituent, has continued to be prepared in the same way. If the disease were due to the polished rice and to a deficiency of certain parts of rice, then the poor would certainly be the sufferers and the poorer any set of people were the more likely would they be to suffer. This has certainly not been shown to be the case. Moreover, the poor are always with us, and the disease should on this theory be endemic in the city. This also is not the case. The theory ignores the fact that the disease affects all classes and the rich or well-to-do as well as the poor, that it has occurred in outbreaks and that deficiency of a particular constituent in any one food is made up for in other foods.

Infectious Ambulances.

During the year the infectious ambulances have been posted at the hospitals with coolies on duty ready at any time to remove a patient. There is also the four-wheeled (horse) ambulance.

At each station a special godown has been constructed for the ambulance and quarters have been provided for the coolies.

Each ambulance has recently been fitted with an arched cover extending the hood over the whole length and affording protection from sun and rain. The public have been informed on more than one occasion by advertisement in the public press, both English and vernacular. It is proposed to have notice boards at the hospitals also, informing the public that an ambulance can be obtained at the hospital for the removal of a case of infectious disease free of charge.

Malaria.

There were 1,293 deaths as against 1,463 in 1910. A somewhat larger porportion of the deaths occurred in the latter six months of the year.

Females suffered to more than twice the extent of males and Mohammedans rather more than Hindus.

The improvement in the death-rate from malaria has been progressive for several years past. The greater part of this improvement must be ascribed to drainage. The climatic changes which occur in Calcutta do not appear to be associated with the incidence of this disease in any way. Malaria is found under a variety of meteorological states, and all we can say is that moisture (rain) and heat seem to favour it.

The Work of the Mosquito Brigades.—These brigades, as in the previous year, began work after the monsoon. It was not thought necessary to deal with the old town, so the staff was divided up into three divisions.

Results show a marked reduction in the number of mosquitoes. It is curious to find how few mosquito larvæ are to be found in some collections of water and how numerous they are in others. Some of these places have to be treated every three or four days.

The question to be considered is whether the results are worth all the labour and expense. Except for an outburst of the mosquito nuisance at the end of February, there have been certainly fewer complaints this year. We are able to record a less mortality from malaria, and the decrease applies to all four districts. It will perhaps be advisable to maintain the brigades at work all through the year (except during the monsoon).

Other Fevers.

This heading covers a variety of fevers which are not otherwise classed. There were 1,427 deaths, as compared with 1,250 in the previous year. Under this column is put remittent fever—an ill-defined fever which causes many deaths (835), but is apt to be

mistaken for other diseases. Females suffer to a greater extent than males, but Hindus and Mohammedans about equally.

Phthisis.

(*Tuberculosis.*)

The mortality from tuberculous diseases has somewhat increased. There is no season for deaths from tuberculous diseases. They occur almost equally throughout the year. There is no known association with the meteorological conditions which prevail in Calcutta. These diseases are about equally prevalent amongst Hindus and Mohammedans, but the Mohammedan females suffer to a high degree. Only three deaths were reported amongst infants.

This disease is admittedly favoured by damp, crowded and ill-ventilated dwellings and is spread by the habit of careless expectoration.

These two factors are generally recognized, but the improvement of dwellings can only be brought about gradually, and the dirty habit of spitting anywhere and everywhere can with difficulty be controlled, except in public places.

With a disease so widespread as phthisis, we ought to extend the benefits of such treatment as may hold out prospects of relief or recovery to the largest number of patients possible. It is for these reasons I advocate the establishment of a dispensary for the tuberculin treatment of consumptives, but it must not be supposed that I do not recognize the value of sanatoria.

Dysentery and Diarrhœa.

These diseases caused 1,938 deaths, as compared with 1,807 last year and 1,780 in 1909. Formerly, however, the mortality was much greater.

These diseases cause more deaths in the wet and cooler parts of the year—the mortality declining in the hottest months. Females suffer to a very much greater extent than males.

Diseases of the Respiratory Organs.

This group of diseases contributes the largest proportion of the total mortality. There were no less than 4,823 deaths, giving a rate of 5·4 per 1,000. This is in addition to the deaths from phthisis. As might be expected, there were more deaths in the winter months than in those of the hot weather. Of the total (4,823) no less than 1,845 deaths occurred amongst infants. As a matter of fact, nearly all the deaths were amongst children and old people.

For these diseases females suffer to a much greater extent than males; their mortality being 7 per 1,000 as against 4·5 for males.

The Filtered Water Supply.

Out of the reports which Major Clemesha and I submitted in May (1911) regarding the filtered water supply of Calcutta, two questions have been subsequently considered, viz., whether there is any necessity for adopting additional means of purification of the water either during the whole or a part of the year (and if so, what measures should be taken), and secondly, whether the form of the weekly report submitted to the General Committee sufficiently indicates the amount and nature of contamination.

On the first question a small Committee was appointed who resolved at their first meeting "that it is desirable that action should be taken to render the filtered water supply, as far as possible, free from suspicion to which it is now liable during the rainy weather."

Following this, estimates of cost were prepared.

The estimates were considered too heavy for the Committee to recommend them and were postponed. Here the subject now rests. On this particular question I have to remark that nothing has occurred in the character of the water, either chemically or bacteriologically, during the past two years to warrant the scare which has been established.

Laboratory.

The total analytical work done in the laboratory during the year under review amounted to 2,095 samples. Of these 1,830 were food-stuffs, 238 of water and 7 samples of a miscellaneous nature. This showed an increase of 170 samples over those of the previous year.

Offensive and Dangerous Trades.

After long consideration, extending over the past four years, the Corporation have now prohibited the establishment of certain trades within the City and have placed restrictions upon others. The removal of trades which are injurious to health is to be effected in course of time, notice of two years being given in the case of knackers' yards, rag depôts, blood, bone, hoofs, bone manure and offal and of three years in the case of tanneries, skins, hides and catgut.

The work of the Food Inspectors.

The work of the food inspectors has been active all through the year. The wholesale dealers have had special attention, and 80 have been prosecuted. The number of samples analysed was 1,426, of which 649 were found adulterated.

There were 918 prosecutions with 779 convictions, and the fines realized amounted to Rs. 15,542. A very large quantity of food was destroyed.

At each of the slaughter houses is a veterinary assistant who first passes the animals for slaughter and afterwards examines the carcases. The meat supply is well protected, and it is only rarely that any diseased meat is discovered in the markets and shops. The meat exposed for sale in the shops is further examined by the meat shop inspectors.

Adulteration of Food.

In 1910 Government were asked to consider the advisability of passing a Sale of Food and Drugs Act on the lines of the English Acts with a view to remedy the defects of the Municipal Act in respect of adulteration.

It may be added that something much more stringent is required than a copy of the English Food and Drugs Act. This is admittedly defective, and with regard to drugs, their being no standard in India as to composition—any Act without such a standard would be useless. Even as regards certain articles of food an authority to lay down standards is required, otherwise no end of legal difficulties will be created.

THE CORPORATION MIDWIVES.

The work of these officers is very satisfactory in results.

By an arrangement with the Lady Superintendent of the Lady Dufferin Hospital the midwives can apply for assistance in difficult cases to that hospital and the house surgeon or some other officer attends and gives the assistance required.

The midwives also visit and give advice to pregnant women as they go on their rounds.

In view of previous experience, a proportion of these cases were taken at random by the district officers and have been verified.

Compared with the general returns of the city, the small death-rate amongst the women is very satisfactory. So also is the small proportion of deaths amongst the new-born. The proportion of still-births is rather higher than that recorded at the burning ghats and burial grounds.

Taking the results as a whole, I think it shows the immense importance of the work these midwives are doing. Illnesses as well as lives are being saved.

INSTRUCTION IN THE LABORATORY.

During the year several applications have been made to attend for instruction in the Corporation Laboratory. All that is possible is to show the apparatus and give a short explanation of working. The analysts are too much occupied to give time for instruction, and the presence of strangers interferes with the work.

I have, however, been able, with the sanction of the Corporation, to set apart a small room for private study for those officers of the Corporation who are preparing for the D.P.H. degree and other examinations.

Neither the analysts nor I have time to give for teaching and the officers concerned must take advantage of the opportunities offered for self instruction.

SMOKE NUISANCE.

Consideration has been given to the proposals for amending the Smoke Nuisance Act, and the Committee have accepted the additions suggested. These include the prohibition of making coke by open fires, the raising of chimneys (except those of private houses) where necessary and the limitation of time for emission of excessive smoke by ocean-going steamers. In addition the Smoke Commission propose action against the use of any naked flame which does not consume its own smoke. This will apply to shops and factories but not to domestic dwellings.

Colonial Medical Reports.—No. 55.—Bombay.

REPORT OF THE BOMBAY BACTERIOLOGICAL LABORATORY FOR THE YEAR 1911.

By MAJOR W. GLEN LISTON, M.D., D.P.H., I.M.S.,

Director, Bombay Bacteriological Laboratory.

WORK CONNECTED WITH PLAGUE.

THE output of vaccine during the past year is a record in the history of the laboratory. The large increase in the demand for the vaccine tried the resources of the laboratory to its utmost. All demands for the vaccine were, however, met with very little additional staff, and, apart from the fact that from some quarters complaints were received regarding the severity of the reaction after inoculation, a matter which will be discussed later, no untoward results of any kind were recorded.

The distribution of the anti-plague vaccine in India and foreign countries shows an increasing demand for the material in all places save Eastern Bengal and Assam, the North-West Frontier Province, and Rajputana.

The large increase in the demand for the vaccine clearly shows the increasing popularity of this method of combating plague. It is particularly gratifying to notice the increase in the Bombay Presidency and in the Native States of India. The extensive inoculation campaign in Hyderabad city is specially noteworthy. Here Colonel Drake Brockman with practically the normal medical staff succeeded in inoculating 75,000 persons. The inoculation campaign in Salem town, carried through by Mr. L. E. Buckley, I.C.S., the Collector, is noteworthy, not only because of the large number of persons inoculated, nearly 52,500 out of a population of about 73,000, but also because of the very careful and painstaking way in which the statistics in regard to the inoculations have been worked out.

During the latter part of the year a number of complaints were received from various quarters regarding the severity of the symptoms, both local and general, which followed inoculation. Even when rigid aseptic precautions were adopted swelling and redness round the site of injection was marked and lasted for three or four days, and the general malaise and fever were more severe than usual. We instituted a very searching inquiry into these complaints. Individual brews were examined as to the length of time that the brew had been incubated and the period which had elapsed between

sterilization and actual use. The brews complained about were almost all recent ones, a fact which confirmed our experience in past years.

A reference to the severity of the reaction following inoculation with fresh vaccine was made in a previous report. There it was shown that two factors in the method of preparing and using the vaccine affected the severity of the reaction after inoculation: (*a*) the reaction was more severe when the vaccine used had been brewed for six weeks than when it had been brewed for four months; (*b*) the reaction after inoculation was more severe when the vaccine used had been freshly bottled than when it had been bottled for four months.

Experiments proved that, experimenting with rats, the immunity produced by vaccine which had been brewed for four or more months was not as efficient as that produced by vaccine which had been brewed from six to eight weeks only. We therefore decided to dispatch from the laboratory vaccine which had not been brewed for a longer period than eight weeks.

Other experiments on rats showed that vaccine which had been kept after bottling for periods up to eighteen months was not much inferior in immunizing powers to that which had been freshly bottled. We therefore determined, as far as possible, to send from the laboratory mature vaccine only. But in the latter half of the year we were forced to issue fresh stock on account of the unprecedented demand. The output for the year 1911 was altogether very much larger than could have been foreseen from our past experience. We were compelled, therefore, to send out what may be termed "immature vaccine."

To avoid unpleasant symptoms in the use of this fresh vaccine, we advised the dose to be reduced from 4 to 3 c.c. if used within three months of the date marked on the bottle. The protection afforded by the reduced dose was probably less than that produced by the larger dose, but we had to bear in mind the fact that a severe reaction following inoculation always tends to make the operation unpopular.

Speaking generally, the larger the dose of vaccine given the greater is the immunity produced; but the size of the dose is limited by the severity of the reaction which follows inoculation, for the larger the dose the more severe the reaction. In selecting a suitable dose of vaccine, therefore, care has to be taken to give as large a dose as can be borne without great inconvenience. For this reason, when fresh or immature vaccine is used, a smaller dose has to be administered than when mature vaccine is used.

The following statistics have been selected from those received in response to a circular letter sent out to those to whom large quantities of vaccine had been supplied during the year. In this letter attention was drawn to certain fallacies in connection with inoculation statistics. Such statistics are our only guide as to the value of the vaccine we prepare, so it will not be out of place to recapitulate three common errors which are made by those who draw up the figures.

(1) The uninoculated population is often overestimated, and especially is this the case when many persons have left the plague-infected centre for fear of disease.

(2) The number of inoculated may be overestimated when monetary rewards are granted; for, under these circumstances, poor persons frequently present themselves for inoculation two, three, or more times in a few months.

(3) The number of attacks and deaths among the uninoculated population is often recorded from the date when plague first appeared, and these events are compared with the number of attacks and deaths after inoculation has been resorted to. It is obvious, of course, that if inoculation was begun towards the close of an epidemic the comparison made above would be very fallacious. The inoculated would have an advantage over the uninoculated.

The following statistics were forwarded by the Sanitary Commissioner of the Government of Bombay showing results of inoculation in four villages.

Village of Nagthana (Satara District).

	Population	Attacks	Deaths
Inoculated	35 ...	2 ...	2
Uninoculated	29 ...	9 ...	6

Village of Aspinga (Satara District).

	Population	Attacks	Deaths
Inoculated	24 ...	2 ...	*Nil.*
Uninoculated	17 ...	7 ...	3

Bania and Brahmin Quarters of Prantij Town (Ahmedabad District).

	Population	Attacks	Deaths
Inoculated	4 ...	*Nil.* ...	*Nil.*
Uninoculated	7 ...	2 ...	2

Village of Sonasan (Ahmedabad District).

	Population	Attacks	Deaths
Inoculated	8 ...	2 ...	2
Uninoculated	20 ...	3 ...	3

Lieutenant-Colonel Dyson, I.M.S., makes the following observations regarding these statistics:—

"The statistics have been compiled from separate households.

"No cases of plague are included which occurred prior to the commencement of inoculation. Only those households have been included in which signs of plague infection appeared after inoculation and after the lapse of the period of incubation."

Temporary Assistant-Surgeon D. C. W. Vasavada, on inoculation duty in the Belgaum Division, while unable to supply accurate statistics at the time of his report, writes as follows:—

"Kittur, with a population of 5,000, had 1,200 men, or nearly 25 per cent. of the population, inoculated just at the beginning of the epidemic. The mortality amongst the inoculated was only one-seventh of what would otherwise have been for them; the people of this village were inoculated with a five to seven months' old serum.

"At Turmari, with a total population of 1,400 and an inoculated population of nearly 700, the mortality amongst the inoculated was one-fifth of the other half. These people had received an eleven to twelve months' old serum, and were inoculated just when the epizootic in rats had begun.

"At Domberkop, with a population of 450, the inoculated were 310, or nearly 75 per cent. The majority of the inoculations in this village were done about two months before any cry of dead rats was raised in the village. The epizootic began afterwards, and it spread in a good number of houses without a single case of human infection occurring.

"A vague doubt has been raised in my mind that as the serum gets older it becomes less protective. The results at Turmari, where almost all persons had received eleven to twelve months' old serum, when compared with those at Kittur, show that with an old serum the mortality was reduced to one-fifth, while with those inoculated with the 'younger serum' it was reduced to as much as one-seventh."

The Assistant-Surgeon acknowledged that these figures are "devoid of much mathematical accuracy," but still they are of great interest. He further observes:—

"While the villages near Kittur and Turmari lost on an average 100 persons to every 1,000 of the population, the death roll at Kittur and Turmari was hardly 30 per 1,000 for their population. The people, therefore, did not require the abstruse aid of statistics to appreciate the good that inoculation was doing for them."

The following is a report of the effect of inoculation in Dhárwar Gaol by Major Bennett, I.M.S.:—

"One thousand two hundred and forty prisoners and establishment were inoculated. No cases of plague occurred, although plague cases were occurring within the closest proximity possible to the gaol. Inoculation has done no harm. No ill-effects have been observed, although prisoners are under the closest observation."

Lieutenant-Colonel Crimmin, I.M.S., Medical Officer in charge of His Majesty's Common Prison, Bombay, states that of 4,386 persons inoculated one only developed plague. He was an under-trial prisoner who had suspicious fever on admission.

The following statistics from Bijápur show the great value of inoculation:—

The Civil Surgeon, Captain Irani, I.M.S., writes: "The three fallacies mentioned in your letter have been guarded against as far as possible. . . . No ill-effects from inoculation have been noticed or reported to me by any of the 3,590 persons inoculated, except one female, who complained of pain and stiffness in the arm for a month or so after inoculation. She is a rheumatic subject, and inoculation has very probably nothing to do with the present complaint. Four cases of fainting occurred soon after inoculation, but they all came round without any special treatment, and were none the worse for it afterwards."

Captain Irani writes in a further communication: "The town was during the last three months of the year almost completely evacuated, and the people were living in isolated camps outside the town. At the height of the epidemic a rough census was taken of the population, including that in the camps, with the help of the chief officer of the municipality. The total population in round figures was 10,000 (9,937).

"The following table shows the number of cases and deaths amongst the inoculated and the uninoculated persons:—

	Population	Attacks	Deaths
Inoculated	3,590 ...	28 ...	8
Uninoculated	6,410 ...	1,228 ...	857

"The following interesting table shows the number of attacks and deaths amongst the inoculated and the period after inoculation when they were attacked:—

	Attacks	Deaths	Recoveries
Attacked within 3 days of inoculation ...	2 ...	2 ...	*Nil*
Attacked between the 4th and 7th days	2 ...	2 ...	*Nil*
Attacked between the 8th and 10th days	8 ...	3 ...	5
Attacked after the 10th day	16 ...	1 ...	15
	28	8	20

"Most of the patients were seen and treated by myself. The one case of failure who was attacked about three weeks after inoculation was that of an old man who had a large bubo in the right submaxillary region, and before I saw him he had applied some very corrosive substance to the bubo which produced extensive inflammation of the soft parts of the neck, and the man died, very probably of asphyxia which was the result of his treatment.

"The result is much more favourable than it seems on paper, as a very great majority of 3,590 persons got themselves inoculated because they were much more exposed to the infection than others who were camping very far from town, and were more or less free from the risks of infection. The former were merchants, shopkeepers, servants, &c., who had to visit the town daily and move about in infected localities on business."

Some interesting statistics have been forwarded by the Civil Assistant-Surgeon Fernandes, Gadag. With regard to the collection of these, he states: "No precautions have been taken against error No. 1 in your letter, but with regard to Nos. 2 and 3 there has been no fallacy."[1]

	Population	Attacks	Deaths
Inoculated	2,742 ...	20 ...	3
Uninoculated ...	30,258 ...	1,695 ...	1,150

He remarks: "Two of the deceased were attacked within ten days after inoculation and one after."

Assistant-Surgeon Fernandes also went round the villages of the Taluka inoculating, and reports as follows:—

[1] **This refers to the fallacies previously mentioned.**

"I had to inoculate a part of the people in each village on my first visit, and revisit the village after three or four days, when others, who watched and saw that none of the inoculated suffered or died from it, came to be inoculated. At Hombal 4 of the inoculated were attacked with plague, with the result that all of them recovered. This had a surprising effect on the people, who had seen that 312 out of 490 non-inoculated attacked had died, Once more after fifteen days I was therefore asked to come, and over 200 more persons got inoculated in two days.

"The example was not lost on the surrounding villages, where no amount of preaching would have been otherwise of much use, and large numbers were inoculated in Lingdal, Hulkoti, and Kurtkoti."

The following statistics of the results in the villages are quoted from the report sent in:—

	Population	Attacks	Deaths
Kurtkoti Village—			
Inoculated ...	451 ...	6 ...	2
Uninoculated ...	4,631 ...	379 ...	277
Lingdal Village—			
Inoculated ...	527 ...	5 ...	5
Uninoculated ...	1,249 ...	136 ...	71
Hulkoti Village—			
Inoculated ...	530 ...	4 ...	2
Uninoculated ...	1,454 ...	96 ...	71
Gadag Mill—			
Inoculated ...	500 ...	2 ...	0
Uninoculated ...	600 ...	24 ...	20

The Assistant-Surgeon reports that most of these deaths (*i.e.*, among the inoculated) occurred within ten days after inoculation.

Assistant-Surgeon R. G. Thakar, on inoculation duty in Satara, reports as follows:—

"I have in the first place given rough figures showing in total the result among the inoculated and uninoculated. These figures are liable to fallacies Nos. 1 and 3 in your letter. As to fallacy No. 2, there are very few chances of reinoculation here, as the measure is not so popular this side.

"I have, however, tried to find out the details of some of the Peths where both inoculated and uninoculated were staying side by side. Here I have tried my best to make the figures as far as possible not liable to the fallacies shown in your letter. I am sorry, therefore, the number of inoculated and uninoculated is very small, but in my opinion it clearly shows the value of inoculation. Only such houses as are in the immediate vicinity of an inoculated house are taken into consideration, so as to give equal advantage to both."

The following are the statistics supplied:—

Rough Figures of both Inoculated and Uninoculated in Satara City.

	Population	Attacks	Deaths
Inoculated	2,915 ...	8 ...	2
Uninoculated ...	13,082 ...	385 ...	327

Details of some of the "Peths of the city where both inoculated and uninoculated were staying side by side and had equal chances of being attacked":—

	Population	Attacks	Deaths
Shanwar Peth—			
Inoculated	10 ...	0 ...	0
Uninoculated	4 ...	1 ...	1
Raviwar Peth—			
Inoculated	26 ...	0 ...	0
Uninoculated	19 ...	7 ...	7
Somawar Peth—			
Inoculated	15 ...	1 ...	0
Uninoculated	42 ...	5 ...	4
Gurowar Peth—			
Inoculated	29 ...	1 ...	1
Uninoculated	45 ...	7 ...	6
Rama's Gote—			
Inoculated	13 ...	1 ...	1
Uninoculated	7 ...	2 ...	2

EXPERIENCES IN THE UNITED PROVINCES.

The Civil Surgeon of Mirzapur reported as under:—

"I am indebted to the Special Health Officer Rameshwarsingh for the following details showing contrasted seizures and deaths among partially inoculated small communities:—

	Population	Attacks	Deaths
Sada Sheo Patti Village—			
Inoculated ...	39 ...	1 ..	0
Uninoculated ...	45 ...	7 ...	7
Lala Nagar Village—			
Inoculated ...	120 ...	6 ...	1
Uninoculated ...	200 ...	17 ...	11
Moolapur Village—			
Inoculated ...	205 ...	2 ...	0
Uninoculated ...	140 ...	26 ...	25

Again, he says, "The attitude of the people to inoculation was one of increasing confidence. The inoculations were carried out without any untoward accident. The following points are perhaps worth noting. It was found that one thing which prevented people coming forward was their idea that special diet (*i.e.*, milk, &c.) was necessary after the inoculation. Many of the poorer people abstained from this reason. I consider it very necessary for the inoculating officer to take pains to combat this idea. Old people, men and women, stand the operation very well.

"It is very necessary to be sure that children especially, actually suffering from plague, are not brought for inoculation—several such cases occurred here, and if one is not on the look out they may be inoculated.

"The public inoculation of European children always has a marked good influence."

Dr. H. D. Karmakar, of Ramdurg, remarks:—

"No persons were inoculated more than once. Inoculation was begun early when the epidemic threatened, but people did not come up for the operation until some deaths had occurred.

"There are three or four instances where all the uninoculated members of the family succumbed to the disease, while the inoculated were not attacked, though they were exposed equally with others to the infection."

Colonial Medical Reports.—No. 55.—Bombay (*continued*).

The Special Health Officer, Gorakhpur, writes that "the three fallacies pointed out by the Director in his letter are, unfortunately, applicable to almost all the places in this district where inoculation with anti-plague vaccine has been carried out, inasmuch as the exact uninoculated population of any place at the time of the epidemic is not available, so that I choose to give only those few cases where the said fallacies are not applicable.

	Population	Attacks	Deaths
Gajpur—			
Inoculated	1,150	22	*Nil*
Uninoculated	3,050	62	60

"About 500 inoculations were done two months before the epidemic and the rest during the height of the epidemic, which has not yet subsided.

	Population	Attacks	Deaths
Janipur—			
Inoculated ...	11	1	*Nil*
Uninoculated	511	92	82
Mahoba—			
Inoculated	91	4	*Nil*
Uninoculated ...	160	14	13

"Inoculations in these places were done nearly two months before the advent of the epidemic, which has been rather sudden both in its onset and subsidence, having died out completely at this time."

The Civil Surgeon, Jhansi, writes:—

"I do not think that inoculation checks a plague epidemic. The intramural population of Jhansi was about 7,500 on January 10, 1912. In January 2,145 and in February 1,020 inoculations were performed, about three-quarters of them intramurally. But the epidemic raged intramurally throughout February. It is now diminishing—probably it is coming to a close by exhaustion of available non-immune persons.

"The fresh vaccine from Parel produced rather severe effects till the dose was lowered to 3 c.c. for a male adult. Several cases had diarrhœa after inoculation. But no really bad after-effects were seen except in 6 cases, all in the practice of an assistant-surgeon. These 6 cases, inoculated at different times and from different phials, developed abscess following inoculation, undoubtedly from neglect of aseptic precautions on the part of the inoculator. I have personally done some 3,000 inoculations for this epidemic, and have never in any of them been informed of a serious illness ensuing (except in those who died of plague after inoculation)."

Experiences in the Punjab.

The Civil Surgeon of Hissar reports that recently while at Tohana he heard that some plague cases had occurred at a village called Khinora and that all the cases recovered. It was said that the recoveries were attributed to inoculation in 1910. He therefore instituted inquiries first through the Naib Tehsildar, and later he sent an assistant-surgeon to make a more detailed inquiry. The assistant-surgeon reported that in the village there had been 14 cases of plague between February 9 and 26, 1912. Eleven of these persons had been inoculated and 3 uninoculated. Of the 11 persons inoculated 10 had been inoculated in 1910, while 1 had been inoculated in 1911.

Of the 14 cases 2 died, both uninoculated. One uninoculated person recovered; the 11 remaining persons who recovered were all inoculated. The Civil Surgeon remarks that this is "a valuable record of the immunity afforded by inoculation even after a period of about twenty months."

Experiences in Rajputana.

The Cantonment Magistrate, Deoli, sends us the following information:—

"The large percentage of inoculation was due to the fact that in the first epidemic many inoculated persons recovered from plague, while only one uninoculated person recovered. Everybody here believes thoroughly in the good effects of inoculation. No monetary rewards ever have been granted, and some of the richer people have paid an inoculation fee. Some persons have been known to come twice in one epidemic for inoculation. Deoli is, in my opinion, a standing example of what wholesale inoculation can do. It is much to be regretted that the statistics have been lost."

Experiences in the Madras Presidency.

An important report has come in from Mr. L. E. Buckley, I.C.S., the Collector of Salem. He writes:—

"The first attack was discovered on August 11, 1910, when the estimated population was 73,000. Between that date and the end of March, 1911, when the population was estimated at about 60,000, there were 2,127 attacks and 1,721 deaths from plague, of which 1,693 attacks and 1,495 deaths were among non-inoculates and 434 attacks and 226 deaths were among inoculates. The total number inoculated in the town was 52,440. The total number of inoculates residing in the town at the end of March, 1911, was, however, higher than this by 1,500 or more, as many refugees from Salem who were inoculated in Rasipur and other villages returned at the beginning of 1911.

"These figures show that of every 100 persons attacked 80·9 died. The percentage among non-inoculates was 88·3, while among inoculated it was 52·1, or, roughly speaking, of every 10 non-inoculates attacked only 1 survived, while of every 10 inoculated attacked 5 survived. The value of inoculation as giving an increased chance of recovery from attack has been clearly demonstrated.

"It is less easy to be certain of the degree of protection from attack afforded by inoculation, owing to the variations of the factors to be considered.

"(*a*) The population of the town, estimated at

73,000 in August, 1910, commenced to decrease rapidly at the end of September, and fell to about 30,000 in the third week of November. In December it began to rise again till it was about 60,000 at the end of March.

"(*b*) It was not until the disease had been established for nearly six weeks that the people could be induced to think of inoculation, and it was not till at least two months after the commencement of the outbreak that the number of inoculates became considerable. After that the number increased rapidly.

"I have attempted to exhibit the history of the attack as plainly as possible in the following statement. In this statement the following items may be considered reliably accurate:—

"(1) Population of town at commencement of outbreak.

"(2) Population of town at beginning of March, 1911.

"(3) Total number of inoculates.

"(4) Numbers of attacks and deaths.

"The following items are based on estimates; in framing such estimates figures have been adopted which are unfavourable to inoculation rather than those which are favourable.

"The estimated population in each week between August, 1910, and March, 1911. The lowest figures—in November—I have put at 30,000 to be on the safe side, though the estimate made after some inquiry at the time was 25,000. The adoption of the higher figure reduces enormously the percentage of attacks among the uninoculated during the worst weeks.

"The number of inoculates in the town in each week. The great majority of those who became inoculated did so in order to be able to stay in the town; a small number became inoculated in order that they might pass in and out on business without having to take passports, and a still smaller number left the town for various reasons after being inoculated.

"If the allowance of 5 per cent. for absentees seems low, any suspected deficiency in the allowance is probably more than compensated for by the weekly population of the town being overestimated, especially in the middle of the outbreak.

"As a consequence the weekly numbers of noninoculates are unreliable. It is fairly certain, however, that they are overstated and it is not improbable that at the worst period of the outbreak they are placed at double what they ought to be.

"The figures given show that the weekly percentage of attacks amongst inoculates varied from a half to one-thirtieth of the weekly percentage of attacks amongst non-inoculates. Taking the figures for November and December, when the outbreak was at its worst and the number of inoculates for the greater part of the time largely exceeded the number of non-inoculates, it will be seen that the percentage of attacks amongst inoculates was not more than one-sixth of the attacks amongst the non-inoculated. In other words, the risk of infection, if inoculated, was reduced to one-sixth of the risk amongst the non-inoculated, but considering that the number of non-inoculates is probably much overstated, the risk may have been reduced to anything as low as one-twelfth.

"Working these conclusions out with the percentages of deaths amongst attacks given in Paragraph 2 the risk of death from plague was reduced amongst the inoculated to one-tenth of the risk amongst the non-inoculated and possibly to anything as low as one-twentieth."

The Superintendent of the Hosur Remount Depôt remarks:—

"The whole taluka has been badly infected during the past nine months and hardly a village seems to have escaped. The first case of plague occurred in the village on October 25, 1911, in a man who had evaded inoculation, though all the other members of his family were done, and all of whom escaped. The last case occurred on January 30, 1912. The population of this village is 2,739, of whom 2,363 were inoculated. The 376 persons remaining uninoculated were chiefly young children and old people. In all 19 cases occurred, 15 amongst the uninoculated, 13 of whom died, and 4 amongst the inoculated, all of whom recovered. These figures speak for themselves regarding the value of inoculation, both in checking an epidemic and reducing the mortality. Wholesale evacuation was not practised. The inmates of an infected house in which either rats had died or a case of plague had occurred were temporarily moved for a few days. The roofs were opened out and the whole place sprayed with emulsion, but no restriction was placed on anyone wishing to go out into camp."

It is unfortunate that we are not told at what stage of the inoculation operations the 15 attacks among the uninoculated occurred.

Experiences in Central India.

The history of an outbreak of plague and the statistics of inoculation in the 99th Infantry at Sehore are interesting. It will be noted that Major Sharman specially lays emphasis on the mild course of the disease among the inoculated. It is unfortunate that clinical diagnosis was not confirmed by a bacteriological as the number of attacks among the inoculated is noteworthy. Two hundred and fifty men were inoculated in March and the remainder as they returned from leave. Inoculation was completed in July.

He remarks: "A few cases of plague having been reported as occurring in the bazaars in March, inoculation against plague of all the men and followers of the regiment then present in Sehore was carried out. There were then only 250 men present, the remainder being absent on colonial leave, but as soon as they returned the remainder were inoculated and the inoculation of the whole regiment, including public and private followers, was completed in July. The only exceptions were Sub-Assistant-Surgeon C. Syed Usoof and his wife, who

declined to be inoculated. Both were attacked with plague in September and both died. I understand that the Sub-Assistant-Surgeon had been attending private cases of plague in the bazaar and he possibly contracted the disease there. He died on September 5 and his wife, after a prolonged illness, on October 5. These were the first cases and no more occurred until October 5, with the exception of some relations of officers' servants, who died during September in officers' compound.

"The lines are situated in close proximity to the bazaar. There are many trees throughout the lines and squirrels and rats are numerous. The Sepoys' houses are of an old pattern, small, badly constructed and with no light or ventilation, except through the doors. The position and construction of these old lines are such that any epidemic occurring in the bazaar (which is not under military control) is almost bound to spread to the regiment. Three guards have also to be furnished to the Residency, jail and Treasury, and consequently men cannot be kept entirely out of infected areas.

"Dead rats and squirrels were first noticed in the lines and adjacent houses about the end of August. Two or three were found daily throughout August and September.

"After the case of Sub-Assistant-Surgeon C. Syed Usoof and his wife in the hospital compound and the officers' servants' relations early in September, referred to above, no cases occurred among the men and followers up to October 5, the date of the first case in the regimental lines.

"A second case was admitted on October 12. From October 12 to October 28 cases were admitted daily; one case on November 2, and the last case on November 5. The maximum was reached on October 15, on which day 11 cases were admitted. The percentage of attacks among Hindus was 8·2 and among Mahomedans 5·3. Nearly all the attacks were very mild and modified by inoculation, and if the disease had not been epidemic and careful inspection for enlarged glands amongst those reporting sick, with a raised temperature, had not been made and other causes of their illness excluded, several would have escaped detection.

"The only 2 uninoculated cases died, and among the 57 inoculated cases one follower only died.

"Glands were not punctured and microscopical examination was not made. The clinical symptoms of the cases were quite clear and all other causes of raised temperature and symptoms were carefully excluded. I also had the benefit of the long experience of plague cases of Major P. B. Haig, I.M.S., Agency Surgeon, Sehore, who was in charge of the Plague Hospital, and who also saw with me any doubtful cases before admission. The results show the enormous advantage of inoculation as a preventive, and more especially how great is the protection afforded by the modification of the disease in those who are attacked."

Experiences in Central Provinces.

The Civil Surgeon, Chanda, writes:—

"Inoculation was begun immediately after plague began.

"The number of persons (7,076) shown uninoculated is far too high, as great numbers left the town soon after the epidemic began. Four thousand would, I consider, be a more accurate number and certainly not too low.

"The number of inoculated is 991. No monetary rewards were given.

"Seven deaths occurred among the inoculated, 5 were attacked within ten days of inoculation.

"Inoculation is of great value in checking an epidemic of plague and diminishes the number of attacks and deaths from the disease, as these figures definitely prove.

"Inoculation does not do any harm to the inoculated. I have seen no case in which there was ill-effect following inoculation."

The Civil Surgeon, Chhindwara, writes:—

"I am fairly convinced, firstly, that inoculation is of immense value in checking an epidemic, could it only be universally and simultaneously performed, and secondly, that it is of great value in protecting from infection and in reducing the mortality.

"As an instance of the first, the Swedish Mission of 300 souls was situated in the midst of a smart but limited epidemic last year. Many plague rats verified microscopically to be plague-infected were found. On my advice every soul was inoculated and beyond one suspicious death no attacks or deaths occurred.

"This year, when plague was at its worst around this Mission, not ono had an attack of plague. All were again inoculated early in the epidemic.

"Of the second, my servant, though inoculated, neglected to get his family protected. He lost 9 out of 13; of the 4 left, one was not attacked, and two children were inoculated before infection occurred.

"He himself, though engaged entirely in nursing and burying his relatives, was not affected."

Experiences in Mysore.

Bangalore City.

The Officiating Sanitary Commissioner says:—

"The results observed in the case of Dobspet, a locality in the city, are interesting. The whole population of this locality, viz., 580, was inoculated without an exception and has been inoculated several times during these few years, for the reason that most of the men and women are employed in European houses where they are not admitted during times of plague epidemics unless inoculated. Dobspet is highly malarious and the residents are in consequence much debilitated in health. Nevertheless, though epizootics among rats frequently occur in Dobspet, the people in a body enjoy immunity against plague, the result doubtless of inoculation.

"The same marked effect was observed in an isolated block of thirty houses in Basavangudi, of which the inmates of twenty-five were all of them inoculated. Plague cases occurred only in the houses the inmates of which were not inoculated."

The Sanitary Commissioner of Mysore remarks:—

"The enthusiasm and earnestness displayed by

Mr. Rajagopal Mudaliar, Sub-Assistant-Surgeon, resulted in nearly one-third of the population at the district headquarters getting inoculated, and to this must be ascribed the large saving in human life that was effected; for whereas amongst the 2,285 inoculated 12 only were attacked and 4 died, there were 219 attacks and 140 deaths amongst the 4,887 uninoculated. Similarly gratifying results were obtained at Tarikere town, where only 3 deaths occurred amongst 1,174 inoculated persons, whereas an uninoculated population of 6,071 lost 47 of their number.

"Even at Birur, where a comparatively large number of persons were struck with plague, the results are striking; there were 10 deaths amongst 605 inoculated persons, whereas 275 persons succumbed amongst 4,072 uninoculated."

Experiences in Coorg.

The Civil Surgeon of Coorg writes:—

"From experience derived from the Mercara attack inoculation has done a great deal of good in subduing the disease. It was also noted that plague attacked only the persons who refused inoculation, such as Mahomedans, &c., who were very perverse and obstinate. Personally, I think inoculation is the only and cheapest way of getting rid of plague in a locality. Most of the cases were bubonic with a few septic cases."

Experiences in H.H. the Nizam's Dominions.

During the past year a very severe epidemic of plague broke out in Hyderabad (Deccan). Lieutenant-Colonel Drake Brockman, I.M.S., came to the conclusion that a vigorous inoculation campaign would be the only means of checking the epidemic, as evacuation on any large scale was impracticable. Inoculation was done on an absolutely unprecedented scale, a striking example of what energy can accomplish. He writes:—

"I took every precaution from the first to make it (*i.e.*, inoculation) a success, paying great attention to many little details in order that the records obtained would furnish us with reliable data upon which possibly useful deductions could be made. Enclosed I have briefly noted down for your information the details I refer to, and I think that you will agree with me that the whole thing has been thoroughly carried out. The inoculation campaign in this city was started in last September and practically ended in January, a period of about four months only, and during that period I was able to inoculate over 75,000 human beings, and that, too, without entertaining any really extra establishment, but done with the agencies of my dispensaries and their medical subordinates in charge. I think, humanly speaking, that these records could not have been more carefully kept, for the whole campaign was from first to last under my personal direction and supervision, and I never allowed any person to perform the inoculation who had not been most thoroughly taught the whole technique of the operation before being allowed to perform it; moreover, I went sometimes twenty miles a day in my motor and constantly visited the places where inoculations were being carried on, and, beyond one arm much inflamed, which was in the case of a European who foolishly played hard tennis directly after being done, I cannot honestly remember any untoward result of the operation out of the whole lot—men, women, and children. It was a sight worth seeing, in the mornings, the crowds of these people hanging about the roads outside these dispensaries awaiting their turn for inoculation."

Experiences in Burma.

The Special Plague Medical Officer, Meiktilla and Sagaing Division, Meiktilla, reported to the Sanitary Commissioner, Burma, as follows:—

"The actual population on the outbreak of plague was about 3,000. (Many people had left the town to reap in Lower Burma, and the figure included a Shan caravan.)

"The epidemic began on November 26. Inoculation began on November 28. One thousand people were inoculated in the first four days; 500 more during the next seven days. Inoculation then ceased. Half then were inoculated. Of this half 8 persons died. Three of these were inoculated in the incubation stage, 5 were not. Of the half not inoculated 107 died between November 27 and March 14."

Experiences in China.

Two letters have been received from Dr. Duncan Whyte, of Swatow. In one he writes:—

"I only regret that there are no facilities for obtaining definite statistics as to the non-inoculated which would form a suitable standard for comparison."

He again writes:—

"This is the first year that Haffkine's serum* has been used in this region, though some years ago some Japanese doctors used Kitasato's (?) serum, with results that did not commend it to the Chinese here. Our order for the first lot—700 doses—was therefore quite speculative.

"Altogether I inoculated over 5,000 people (5,431 is the exact figure), and of these over 1,000 inoculations were performed in a town where plague had been raging for a couple of months already. Of those inoculated, only two were infected within five days, and they both died. Three or four cases were infected later, but were all very mild.

"These two deaths did not really affect the people's faith in the remedy, as they believed that these individuals already had infection on them when they were inoculated.

"In another village, to which plague recurs every year, I inoculated 337 people before the epidemic had commenced. Two of these were subsequently infected, and both got better."

* Vaccine.

Colonial Medical Reports.—No. 55.—Bombay (*continued*).

Research Work.

In an earlier part of this report reference has been made to the severity of the reactions after inoculation with fresh vaccine, and we saw that the severity of the reaction depended on two factors in the preparation of the vaccine:—

(1) The length of time the plague bacilli were allowed to grow in the broth before being killed, *i.e.*, the length of time the vaccine had been "brewed."

(2) The length of time the killed vaccine had been bottled before use, *i.e.*, the length of time the vaccine had been "matured."

The reaction after inoculation was milder the longer the vaccine had been "brewed" and the longer it had been "matured." Now, the reaction which follows inoculation is one of the greatest drawbacks to the operation. People dread this reaction, even though, as a matter of fact, it is generally comparatively mild. Yet there is always some fever and swelling at the site of inoculation.

In proportion as the reaction after inoculation is less severe so the popularity of the operation increases.

A question which has engaged our attention is one of considerable importance, and has reference to the so-called "negative phase." The experiments were made with the object of answering the question: "Do people immediately after inoculation run a greater risk of acquiring plague infection than if they had not been inoculated at all? Can an inoculated person continue to live in plague-infected surroundings without increasing his risk of infection while he has the fever and other symptoms attending inoculation?"

Captain Stevenson has succeeded during the past year, after experimenting on a large number of animals, in obtaining a very definite answer to the questions raised above.

In the first experiment 280 Madras rats were used. They were divided into eight groups, each containing 35 rats. These rats were inoculated each with ¼ c.c. of a vaccine which had been brewed for two months. The date of sterilization of the vaccine was February 24, 1911.

Group A received the vaccine on March 30, fourteen days before infection with living bacilli.

Group B received the vaccine on April 3, ten days before infection with living bacilli.

Group C received the vaccine on April 4, nine days before infection with living bacilli.

Group D received the vaccine on April 6, seven days before infection with living bacilli.

Group E received the vaccine on April 8, five days before infection with living bacilli.

Group F received the vaccine on April 10, three days before infection with living bacilli.

Group G received the vaccine on April 12, one day before infection with living bacilli.

On April 13 the following numbers of rats were alive in each group, a group (H) which had not been inoculated being added to the series to act as a control:—

A	B	C	D	E	F	G	H
32	32	33	29	31	32	35	35

On that date all the rats received a dose of ½ c.c. of a 1 in 500,000 dilution of an emulsion of 1·925 grm. of a spleen of a plague-infected rat. At the close of this experiment the following number of rats remained alive in each group:—

A	B	C	D	E	F	G	H
14	12	12	11	15	20	13	4

There was, therefore, no "negative phase" even when infection was given twenty-four hours after inoculation.

In a second experiment the rats were infected at shorter intervals after being inoculated. Here again 280 Madras rats were used, and there was no "negative phase" even one and a half hours after inoculation, for all the inoculated rats survived in larger numbers than their uninoculated companions.

The practical point in these experiments is that they confirm the evidence obtained by Colonel Bannerman in 1901 that the anti-plague vaccine can be safely administered to persons living in plague-infected houses.

In addition to my duties as Director of the Laboratory, I have been responsible for the supervision of the work of the Plague Research Commission, which has its headquarters at this laboratory. The officers of the Commission have been working during the past year in a number of places away from the laboratory, as, for example, in the United Provinces and in the Madras Presidency, where branch laboratories have been established, as well as at this laboratory.

The Health Department of the City of Bombay continues to send daily for examination all rats found dead or caught alive within the bounds of the municipality. All the dead rats, not already too putrid when received, are submitted to *post-mortem* examination; and those found to be plague-infected are reported to the Medical Officer of Health, who deals with the locality from which the rat was sent. During the year, 134,401 rats were thus examined, of which number 11,573 were found to be plague-infected.

Poisonous Indian snakes are kept in the laboratory for the purpose of obtaining a supply of venom for the manufacture of anti-venene. The number of snakes received during the year was 44.

Research work in connection with other diseases than plague has been confined in this laboratory to the study of three diseases, guinea-worm disease (dracontiasis), the treatment of syphilis with "606," and the treatment of leprosy with a vaccine prepared from a streptothrix which was isolated by Captain T. S. B. Williams, I.M.S. Details regarding this streptothrix have been published by him in No. 42, "Scientific Memoirs by Officers of

the Medical and Sanitary Departments of the Government of India."

Dr. Turkhud, M.B., C.M.Edin., has been responsible for the work in connection with the study of dracontiasis. It will not be out of place here to give a brief account of this disease, which is very prevalent in certain parts of the Presidency and which is often a serious cause of sickness, although not of death. In some parts the disease is so prevalent that the Agricultural Department has found it necessary to issue a handbill which describes how the disease is spread.

The disease is caused by the guinea-worm, *Filaria medinensis*. The worm, as a rule, produces few symptoms except perhaps urticaria or intense itching, until a little vesicle appears on the skin, generally near the ankles, but occasionally in other parts of the body. The worm can often be felt as a cord beneath the skin before the vesicle is noted. The little vesicle bursts and from it a little turbid fluid exudes. In the centre of the ulcer left by the bursting of the vesicle lies the pointed extremity of the worm. The fluid which is ejected by the worm will be found to contain myriads of minute embryos or young worms, which can swim about actively in water.

In 1870, Fedschenko showed that these embryos soon die in water unless they find in the water a small crustacean of the genus cyclops. This cyclops is a minute transparent creature, only just visible to the naked eye, a little smaller than the head of a pin. In some way yet undetermined the embryo worms enter the body cavity of the cyclops, where they live for some weeks. Certain changes take place in the young worms in the body of the cyclops which fit them for their next stage of development in the body of man.

It had been suggested by Manson and proved by Leiper in 1907 that the cyclops containing the young worms are swallowed in drinking water by man. In the human stomach the cyclops are killed by the gastric juice, but this very juice at the same time activates the young worm within the body of the cyclops. The young worm makes frantic efforts to escape from the body of the cyclops, darting about from side to side. Finally it emerges and penetrates the wall of the man's stomach. The worm at this stage measures about one-fiftieth part of an inch; it grows gradually, and in the course of a year the female worm has attained a length of about thirty inches. Meanwhile the worm has wandered from the region of the stomach to some other part of the body, most often to the tissues of the leg. The mature female worm is practically a long slender bag filled with minute worms, the embryos mentioned above. These embryos, as we have seen, must find their way to water containing the cyclops, else they soon perish. To maintain its existence the worm has therefore to pass from man into a cyclops and from a cyclops back to man.

Dr. Turkhud's observations have shown that the intermediate host of the guinea-worm, *i.e.*, cyclops, is a very common inhabitant of all ponds and wells in Bombay and can be readily collected by the following method, which is found to be the most satisfactory one for securing these copepods in large numbers from any collection of water. About a bucketful of water should be carefully strained in small quantities at a time through a piece of fine muslin. The cyclops will be caught on the muslin, from which they can be transferred by dipping the upper surface of the muslin into the water contained in a wide-mouthed bottle. In addition to cyclops, water-fleas and a whole host of other animalcules are stranded on the muslin; the larger of these, as shrimps, beetles, and such-like creatures, should be removed before the muslin is dipped into the water of the collecting bottle.

The stock of the cyclops obtained in this way can be kept alive in the laboratory in a suitable glass vessel. At least two species of cyclops have been observed in Bombay, both of which can act as intermediate host for the guinea-worm. Other crustaceans, such as Diaptomus and Daphnia, failed to act as intermediate hosts for the worm.

Two interesting points in the life-history of cyclops have been observed which go to explain the marked seasonal prevalence of the disease.

First it has been noted that the cyclops begin to multiply about the month of March and are very abundant throughout the rains. The number of cyclops to be found in water begins to diminish with the close of the rains. During the winter months only a few can be found and these commence to multiply, as mentioned above, about the beginning of the hot weather.

The second point of interest is that cyclops apparently prefer to live and feed near the bottom of a well, so that they are most likely to be found in a sample of drinking water when the well is low, that is, during the hot weather.

It is interesting, therefore, to know, so far as general observation goes, although no actual statistics are available, that the guinea-worm most commonly causes inconvenience in man (that is, when it makes its way to the surface of the body to discharge the young worms) in the hot season and rains, just the season, be it noted, when cyclops are most numerous and when they are most likely to be found in drinking water.

This is not the place to describe the minute structural changes which take place in the worm during its sojourn in the cyclops. We may mention, however, that by repeating Leiper's experiment, in which he placed cyclops containing larval guinea-worms in a very weak solution of hydrochloric acid, similar in strength to that found in the gastric juice, we confirmed his observation that the cyclops was soon killed and that the worm became very active and escaped from the body of the cyclops.

Although this disease is very common in certain parts of the Bombay Presidency, 2,000 cases, for example, having been reported to be present in the famine camps in the month of March in the Panch Mahals district, yet the disease is one which can be avoided by the simple method of passing all

LONDON SCHOOL OF TROPICAL MEDICINE.

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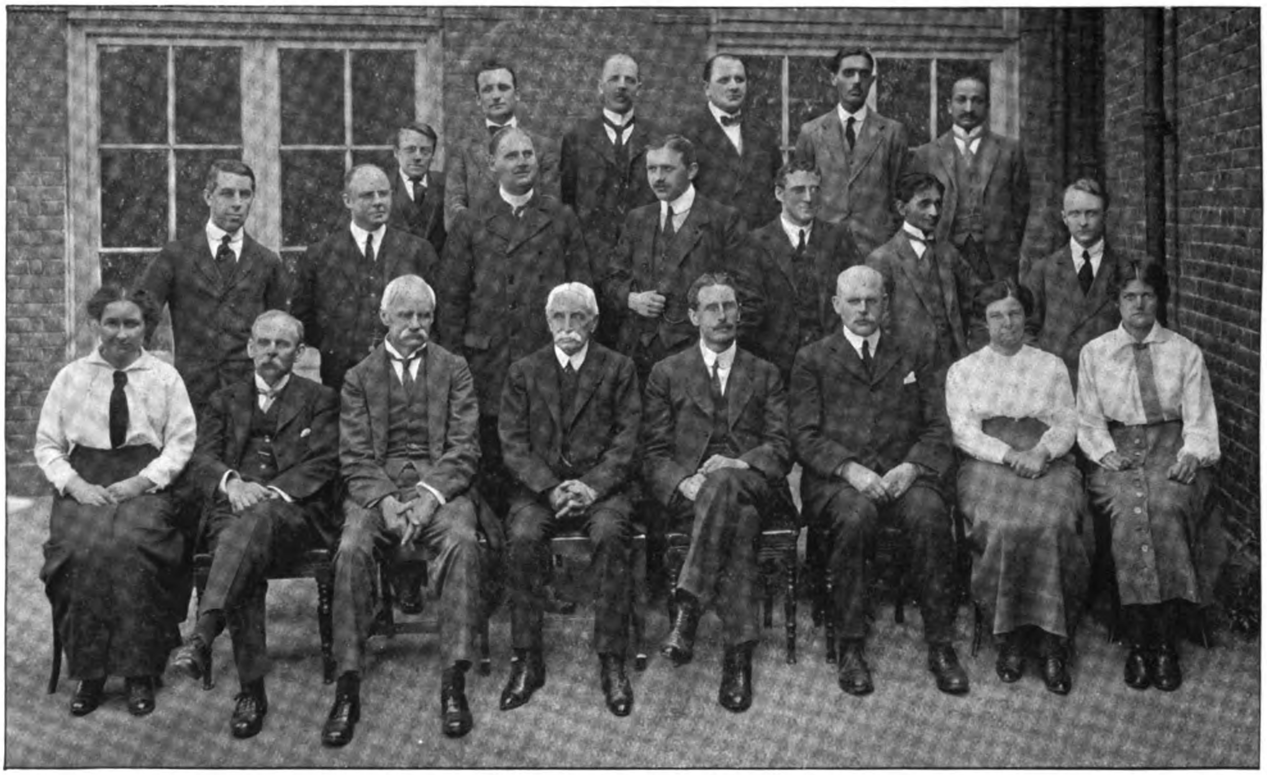

Back Row.—Robert (*Laboratory Assistant*). R. Umana, S. A. Ellerbek, G. B. Warren (*Sen. Laboratory Assistant*), S. S. Sokhey (*Lieut. I.M.S.*), V. L. Sathé.
Middle Row.—R. P. Cockin (*Assistant Helminthologist*). J. A. Nydegger, M. Wilson, B. B. Bagh, J. W. Thomson (*Deputy Director*), S. K. Vaidya, A. C. d'Arifat.
Front Row.—Miss G. J. Campbell, Col. A. Alcock (*Entomologist*), Dr. F. M. Sandwith (*Lecturer*), Sir F. Lovell, C.M.G. (*Dean*), H. B. Newham (*Director*), Dr. H. Williams (*Lecturer*), Miss J. A. Vaughan, Miss E. E. Smith.
Absent.—J. S. Smith, Miss G. C. Dixon, R. T. Leiper (*Helminthologist*), J. G. Thomson (*Protozoologist*).

drinking water through a piece of fine muslin. The cases in the famine camps must have been infected a year previously and could not, therefore, have been prevented by any arrangements made for supplying water at the camps.

In addition to the simple method of straining the water through muslin, there are, of course, other more radical and efficient methods of checking the spread of disease. These methods endeavour to prevent persons suffering from the disease from immersing their bodies, especially their feet, in water which is to be used for drinking purposes. The persistence of the disease in certain areas, despite the fact that it can be prevented by simply straining the drinking water through muslin, can only be accounted for by a want of knowledge among the people of how the disease is spread. This is a state of affairs which I think might easily be remedied.

The Treatment of Syphilis by Salvarsan.

Towards the end of 1910, Professor Ehrlich was kind enough to send us some capsules of his new drug, dioxydiamido arsenobenzol, popularly known as salvarsan, or "606." He recommended this drug for the treatment of syphilis and other diseases due to spirochætes. Among the first cases we treated with the drug was a British soldier who was in an advanced and rapidly progressing stage of syphilitic disease and who had failed to respond to energetic treatment with mercury. The Senior Medical Officer in charge of the Station Hospital, Colaba, asked us to treat this patient with salvarsan. The effect of the treatment was nothing short of marvellous. The patient, whose case had been regarded as a hopeless one, was completely cured in the course of a few weeks and was soon fit to return to his regiment. Our experience with this case encouraged us to use the new drug in other cases. In the year 1911 more than seventy cases of syphilis were treated by us with salvarsan, while many more have been treated this year.

During the period immediately following the introduction of the drug a number of methods of administering it were suggested. We tried some of these methods, but soon came to the conclusion that the best method both from the point of view of efficiency and safety, as well as for the comfort of the patient, is the intravenous method, using the alkaline solution of the di-sodium salt. This method has been the one so strongly recommended by Professor Ehrlich. The reason for referring to this subject in this report is to endeavour to explain some of the causes for the conflicting opinions which have from time to time appeared both in the lay and medical press, and to record our experience of the use of this drug.

At the outset we wish to insist that treatment with this drug must be carried out by persons thoroughly familiar with the practical application of bacteriology. There can be no doubt that in unskilled hands any method of administering the drug is attended by grave danger.

In our experience of the use of the drug, which has now been administered more than three hundred times to some one hundred and fifty patients, we have encountered no untoward symptoms. The majority of our patients have felt so little inconvenience after the intravenous injection of the drug that they have been able to resume their ordinary duties twenty-four hours later. Our experience, both in our own practice and that of others, in regard to the subcutaneous use of salvarsan has not been so fortunate. The injection of the drug in this way often leads to extensive necrosis of the tissues in the neighbourhood of the site of injection, which may lead to abscess formation many months after the injection. This method of administering the drug is also very painful, and cannot under any circumstances be recommended.

The effect of salvarsan on syphilitic disease is rapid and marked. In a few weeks extensive lesions *heal* up. The majority of our patients have been treated in the hospitals in Bombay. No relapses have come under our notice, but we have found it practically impossible to keep in touch with the majority of our patients after they have recovered and left the hospital. None of the cases treated have returned to the hospital with relapses of the disease.

In addition to treating cases of syphilis we used salvarsan for the treatment of certain cases of ulcerating granuloma of the pudenda (which were not syphilitic in origin), but with little success.

The treatment of leprosy with the vaccine prepared from the streptothrix isolated by Captain T. S. Beauchamp Williams, I.M.S., was continued during the year.

There were ten cases under treatment at the Ackworth Leper Asylum at the time of the departure of Captain Williams on leave in May, 1911. Of these one absconded and one stopped treatment. No cases appeared to get worse.

The four cases which showed considerable improvement were of mixed variety. In these the nodules on ears and face completely disappeared, and the patches of anæsthesia became markedly reduced in size. It must be admitted, however, that these were by no means advanced cases, and that the nodules had not become very prominent. But there appeared to be no doubt that the vaccine exercised a beneficial effect on the disease in these cases. It was also noticed that the improvement was generally more rapid in the anæsthetic areas than in the nodules.

Our experience goes to show that it is possible to hold the disease in check by a prolonged course of the vaccine.

The initial dose recommended is 0·5 c.c., the injections being repeated every week or ten days. The dose should be increased gradually with caution, as the vaccine sometimes produces a very severe reaction. The amount of reaction produced usually varies very much. It may be very slight—only a little itching or heat in the nodules; at other times there may be a high fever accompanied with acute inflammatory swelling of the nodules, and the

reactionary symptoms may be alarmingly severe. The maximum dose is 5 c.c., and should be used only in anæsthetic cases and with the utmost caution.

The treatment requires to be kept up for a very long time, and the vaccine should be used with the main object of so immunizing the patient that an opportunity for the fresh growth of the streptothrix is not provided; further exacerbations of the disease are thus prevented. The state of immunity produced must be maintained by the repeated and judicious use of the vaccine. In some cases massage or a cupping glass, applied to the nodules, will be found to be valuable adjuncts to the action of the vaccine, especially where the blood-supply of the nodules is deficient.

Colonial Medical Reports.—No. 56.—Bihar and Orissa.

MEDICAL REPORT OF THE HOSPITALS AND DISPENSARIES IN BIHAR AND ORISSA FOR THE YEAR 1912.

By Lieut.-Colonel F. J. DRURY, M.B., I.M.S.

Inspector-General of Civil Hospitals, Bihar and Orissa.

THE year under review was much healthier than its predecessor, the total death-rate among the general population being 31·01 per mille against 35·12 in 1911. But the number of patients treated in hospitals and dispensaries in all classes for some of the more important diseases, viz., small-pox, plague, cholera, malaria, and tubercle of the lungs increased in 1912—a fact which unmistakably points to the greater appreciation by the people of the benefits of the treatment afforded in dispensaries.

Deaths from plague and cholera among the general population numbered 58,324 and 77,023 against 73,829, and 88,583 respectively in the previous year. The dispensary attendance from these causes is represented by 4,622 and 10,023 cases against 3,521 and 9,070 in 1911.

The total deaths among the general population from small-pox were 2,357 against 3,382 in 1911. In hospitals and dispensaries 190 cases were treated against 149 in the preceding year. The vaccinal conditions were noted in 25 cases only, and were as follows: 18 were unprotected; 2 had distinct marks of vaccination; 5 had indistinct marks of vaccination.

Malaria was also less prevalent among the general population than in the previous year, the mortality from fevers being 644,926 against 744,090 in 1911. The total treated under the head malaria in all classes of hospitals and dispensaries was 588,104 against 506,179 in 1911. There is no doubt that the value of quinine in the treatment of malaria cases is gradually being recognized by the people. From the Central Depots established by the Bengal Government and continued by this Government at headquarters of districts under the control of Civil Surgeons with the object of popularizing and extending the use by the people of quinine in such cases, 281,800 pice-packets, each containing 10 grains, and 203,928 tablets each containing 3⅓ gr., were sold to post offices and 20,208 pice-packets and 279,300 tablets to other retail vendors in this province for sale to the public. The total amount realized in 1912 was Rs. 6,059.5. I gather from the Civil Surgeons' reports that this beneficent measure of Government is greatly appreciated by the people.

The total number of patients treated in dispensaries of all classes for tubercle of the lungs increased from 2,924 in 1911 to 3,184 in 1912. The statistics specially collected for dispensaries show that 318 in-patients were admitted in these institutions in 1912. Of these 60 or 18·86 per cent. died. It should be noticed that this disease was more prevalent in the Patna district than elsewhere.

The highest mortality amongst in-patients in dispensaries was, as usual, from plague, *i.e.*, 58·00 per cent. of the cases admitted against 58·54 per cent. in 1911. Next to this comes cholera with a mortality of 53·10 per cent., followed by pneumonia and opium poisoning with 34·17 and 33·33 per cent. respectively.

The only noticeable feature of the return is that the number of female patients increased from 359,044 in 1911 to 362,671 in 1912 or 1·01 per cent. Of the children treated in 1912, 359,212 were males and 230,423 females against 337,660 and 218,951 respectively, in the previous year. The increases in their number, which were 6·35 and 5·24 per cent. respectively, are satisfactory.

The operative surgical work of the province also shows an increase in 1912, the total number of operations performed in all classes of hospitals and dispensaries having been 126,860 against 121,147 in 1911. The number of operations performed in dispensaries in 1912 was 99,994 against 95,871 in 1911. The results of these operations were as follows:—

Year	Cured	Relieved	Discharged otherwise	Died
1912	95·55	3·93	0·32	0·20
1911	96·26	3·24	0·30	0·20

Of the more important operations, it may be mentioned that there were 3,249 extractions of the lens for cataract, 52 abdominal sections (laparotomies), 20 ovariotomies, 103 litholapaxies, 82 lithotomies, 114 operations for radical cure of hernia, 60 operations for strangulated hernia, 51 for abscess of the liver, and 194 for scrotal tumour. Most of the last-named operations were performed in the Cuttack General Hospital, the tumours weighing from a few pounds to 50 pounds.

Colonial Medical Reports.—No. 56.—Bihar and Orissa (*continued*).

The largest number of operations of all kinds (4,132) were performed in the Bankipore Hospital, followed by the Patna City Hospital with 3,731, the Bettiah Hospital with 3,210 and the Gaya Pilgrim Hospital with 2,792.

There are 7 leper asylums in this province, one each at Muzaffarpur, Bhagalpur, Deoghur, Puri, Sambalpur, Lohardaga and Purulia. Of these, 4 are maintained by the Mission to Lepers in India, 2 from private funds and 1 by a municipality aided by local subscriptions. Most of these also receive monetary aid from Government. There were treated in 1912, 3,415 lepers (1,094 in-door and 2,321 out-door) in the asylums.

Civil surgeons inspected 86 outlying dispensaries four times and upwards, 54 three times, 38 twice and 19 once in 1912, and eleven were not inspected. In cases of certain outlying dispensaries in the Patna District this duty has been delegated under authority to one of the teachers of the Patna Medical School.

I inspected all the medical institutions at head-quarters of 20 districts in 1912, altogether 89 institutions including the Police Training Schools. My suggestions for improvements have, I am pleased to report, received the necessary attention.

Civil surgeons have generally submitted interesting reports on the medical work done in their districts during 1912. They show that improvements were effected in many dispensaries, calculated to increase the comforts and conveniences of the sick. In several places new dispensary buildings were constructed or were under construction during the year under review.

The great want of this province is a suitable hospital for Europeans. The matter was discussed in 1912 and is still under consideration. It is proposed to build a hospital and sanitarium at Ranchi where the climate is very suitable for the purpose. A site for the latter has been selected. At Bankipore necessary provision for a European Hospital will be made in the scheme for the remodelling of the Patna Medical School and the Bankipore General Hospital, which is now under the consideration of Government.

It is my pleasing duty to report that medical officers of all ranks, Indians and Europeans, have as a whole done excellent work during the year under review. The amount of medical relief rendered in this province as already reported was satisfactory, and it is hoped that it will be possible to record further expansion in this direction in future years.

Colonial Medical Reports.—No. 57.—Basutoland.

MEDICAL REPORT FOR BASUTOLAND FOR THE YEAR 1911.

BY THE PRINCIPAL MEDICAL OFFICER.

Population and Vital Statistics.

The Census of 1911 shows that the birth-rate is considerably higher than the death-rate.

In seven years the total population shows an ncrease of 55,659.

The increase of females during the period is greater than that of the males; 35,430 as against 20,229. It is not possible to say whether this is real or apparent. When the Census of 1911 was taken there were 24,630 males returned as absent from the country; no return of this kind was available in 1904, so no comparison is possible.

The density of the coloured population as compared with the previous Census is as follows:—

	1911	1904
Number of persons per square mile ..	38·97 ..	33·78
Acres per head of population	16·42 ..	18·94
Number of occupied huts per square mile	10·86 ..	8·42
Number of persons to each occupied hut	3·61 ..	4·01

In connection with the above table it should be noted that only about one-third of the country is habitable all the year round, or capable of being cultivated, the other two-thirds being inhospitable mountain ranges. It follows, therefore, that the density of the population per square mile is more nearly 116·91, and the number of acres per head of the population available for raising foodstuffs only 5·44. It is gratifying from the point of view of public health to note that in spite of the increasing density of population, the number of persons per occupied hut is less than in 1904. No vital statistics are available for the period under review, as there is at present no registration of births and deaths.

General Health.

The general health of the territory has been good. There was an isolated outbreak of small-pox in the Mafeteng district in June, but only one case was reported. The village was quarantined and the inhabitants vaccinated. Vaccination was encourged as much as possible throughout the territory, and natives requiring passes were subjected to compulsory vaccination. There were no further cases of small-pox during the year under review. 182,830 vaccinations and re-vaccinations were performed. The number would have been much greater but for an unfortunate outbreak of severe vaccinia in many vaccinated people, which was traced to one particular strain of lymph. Some cases were very severe and characterized by moderately high fever and diffuse vesicular eruption. The eruption generally appeared about fourteen days after the vaccine pustule had begun to dry up. The vesicles frequently attained a large size and sub-

Return of Diseases and Deaths in 1911.

Basutoland.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	1	—	16
Anæmia	6	—	303
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	496	—	496
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	4
Diabetes Insipidus	—	—	—
Diphtheria	2	—	42
Dysentery	19	1	201
Enteric Fever	26	3	60
Erysipelas	1	—	16
Febricula	8	1	373
Filariasis	—	—	—
Gonorrhœa	1185	—	1185
Gout	1	—	12
Hydrophobia	—	—	—
Influenza	2	—	232
Kalar-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	8	—	8
(b) Anæsthetic	17	—	17
(c) Mixed	16	—	16
Malarial Fever—	2	—	10
(a) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	3	—	4
Measles	190	—	190
Mumps	77	—	77
New Growths—	—	—	—
Non-malignant	124	1	302
Malignant	10	—	17
Old Age	—	—	—
Other Diseases	78	—	78
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	1	—	1
Rachitis	5	—	5
Rheumatic Fever	—	—	—
Rheumatism	33	—	1340
Rheumatoid Arthritis	—	—	—
Scarlet Fever	67	—	67
Scurvy	9	—	47
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Smallpox	1	—	1
Syphilis	—	—	—
(a) Primary	24	—	24
(b) Secondary	17	—	1045
(c) Tertiary	35	—	1220
(d) Congenital	1396	—	1396
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	38	3	92
(a) Phthisis Pulmonalis	35	10	168
(b) Tuberculosis of Glands	54	1	116
(c) Lupus	—	—	—
General Diseases—*continued.*			
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	130	—	130
Whooping Cough	1020	—	1020
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	178	1	747
Circulatory System	—	—	—
(a) Valvular Disease of Heart	40	5	145
(b) Other Diseases	17	2	78
Digestive System—	108	6	1169
(a) Diarrhœa	—	—	—
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(d) Abscess of Liver	—	—	—
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	—	—	—
(g) Cirrhosis of Liver	—	—	—
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	—	—	—
Ear	6	—	454
Eye	107	—	776
Generative System—	—	—	—
Male Organs	78	1	243
Female Organs	251	7	2146
Lymphatic System	21	1	231
Mental Diseases	—	—	—
Nervous System	59	7	658
Nose	9	—	403
Organs of Locomotion	88	—	361
Respiratory System	80	6	4720
Skin—	—	—	—
(a) Scabies	396	—	396
(b) Ringworm	53	—	53
(c) Tinea Imbricata	—	—	—
(d) Favus	13	—	13
(e) Eczema	3	—	531
(f) Other Diseases	14	—	1687
Urinary System	25	3	129
Injuries, General, Local—	157	4	812
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	1	—	30
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	1	—	109
Poisons—	3	—	3
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	42	—	42
,, Minor	2640	—	2640
Other Operations	664	—	664
Eye	108	—	108
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

sequently developed into large impetiginous ulcers. Two or three deaths were reported as due to the disease.

The connection of the disease with vaccination was so obvious that the natives became alarmed and vaccination had to be discontinued for a time. Prior to this it was largely sought after except in the Mohale's Hoek district, where for some unexplained reason the majority of the people refused to be vaccinated. The rapid spread of small-pox during the recent year in this district was the result of the refusal.

Scarlet Fever.

There were sixty-seven cases recorded. Sore throats were very prevalent, and I think that owing to the difficulty of diagnosing scarlet fever in coloured patients many cases were overlooked.

Leprosy.

It has not been possible during the year to carry on any further experimental work in connection with the theory of transmission of leprosy by the bed bug. The following case, however, lends some support to the theory.

A native with leprous lesions on the face, who had recently returned from the gold fields, came under notice in April last, and I elicited the following history: The lesions on his face had appeared about three months before I saw him, and he and an intimate friend with whom he was working (who simultaneously developed similar lesions on the face) attributed them to the fumes of dynamite.

Careful inquiry failed to elicit in either case any contact with lepers in their their own villages or elsewhere. The only occasion in which they had come in contact with lepers was about two years ago when in company with a third man they were overtaken by night when travelling in the mountains and put up at a village where they were entertained by people whom they afterwards discovered to be lepers. The lepers had put them to sleep in the hut, which they, the lepers, were accustomed to sleep in. All three men were so badly bitten by bugs that they had to spend part of the night outside. They remained two nights at the village occupying the same hut both nights. It is interesting to note that two of the three men simultaneously manifested signs of leprosy within two years and denied having come into contact with any lepers in the interval. With some difficulty I succeeded in tracing the third man and found he had suspicious looking macular patches on the forehead and cheeks. They were not, however, sufficiently characteristic to warrant one in making a definite diagnosis of leprosy. This patient will, however, be called up for examination in the course of this year.

Arrangements are now in progress for the formation of a leper settlement close to Maseru. When it is ready we expect to have about 600 inmates during the first year. Further opportunities for the study of the etiology of the disease will then be available.

Malta Fever.—The existence of this disease has long been suspected in Basutoland but the cases have always been returned as enteric. During the past year Dr. Nattle of Mohale's Hoek collected some blood from suspected cases and the specimens all gave a positive agglutination reaction for the *Bacillus melitensis*.

Tuberculosis.—Tuberculosis accounts for nearly 1 per cent. of all cases treated. Few cases of miner's phthisis have been noticed. Considerable success has attended the treatment of tubercular glands by means of combined injections of human and bovine tuberculin.

Meteorological.—The year was one of unusual dryness, but I am unable to trace any special effect from it on the general health of the community.

(Signed), E. C. Long,
Principal Medical Officer.

Meteorological Return for the Year 1911.

	Temperature					Rainfall		Winds	
	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force
	Mean	Mean	Mean						
Jan.	48·2	83·2	55·5	27·7	69·3	3·38	57	N.	3
Feb.	47·1	82·5	51·9	30·8	68·1	4·05	62	N.	1
Mar.	43·5	74·7	51·6	23·1	63·2	8·51	71	N.	1
April	40·2	68·7	43·9	24·8	56·3	3·36	80	N.	1
May	32·9	60·2	37·9	22·3	49·0	2·89	79	N. & W.	1
June	23·4	57·7	29·1	28·6	43·4	0·22	75	N.E.	1
July	25·5	60·7	31·2	29·5	46·0	1·20	61	N. & N.E.	1
Aug.	30·0	62·0	35·1	26·9	47·0	0·88	66	N.	1
Sept.	33·6	73·4	40·0	33·4	56·7	1·33	40	W.	1
Oct.	44·0	75·6	49·2	26·4	62·4	3·26	57	N.	2
Nov.	47·4	78·2	51·7	26·5	64·9	5·04	60	N.W.	2
Dec.	49·0	87·0	54·8	32·2	70·9	1·70	50	N.	3
Total	464·8	863·9	531·9	332·2	697·2	35·82	758		
Mean	38·7	71·8	44·3	27·6	58·1	2·98	63·1		

Colonial Medical Reports.—No. 58.—Somaliland Protectorate

MEDICAL REPORT FOR THE SOMALILAND PROTECTORATE FOR THE YEAR 1911.

By A. J. M. PAGET, M.D.,
Senior Medical Officer.

THE Somaliland Protectorate has a total area of some 68,000 square miles. Except for the three principal coast towns the country is not in occupation by the Administration. The Government institutions dealt with under this report are:—

HOSPITALS.

A general hospital is situated at each of the three principal coast towns, namely, at Berbera, Bulhar, and Zeyla. A disinfecting station, furnished with a Clayton disinfector, exists at Berbera.

At Berbera the accommodation is forty-two beds, at Bulhar four beds, and at Zeyla six beds. All the hospitals are in need of repair. The Zeyla Hospital is regarded as almost unsafe owing to the heavy beams in the roof and sand-scoured outer walls.

Camp hospitals, constructed of matting huts erected on wooden frameworks, have been in use at each of the towns for meeting an epidemic of small-pox. These huts have been added to as requirements have demanded. They answer their purpose very well, and withstand the wind far better than the tents used formerly.

The number of admissions to the hospitals was 190; the number of deaths in hospital was 6.

The above figures are exclusive of 2,846 cases with 1,256 deaths from small-pox, treated at the small-pox camps.

DISPENSARIES.

There is a dispensary attached to each of the hospitals. The attendance during the year totalled 30,880.

ASYLUMS.

No asylum exists. In the case of criminal prisoners who are found insane, provision is made of a small ward in the jail under medical supervision.

SCHOOLS.

A Government-aided school exists at Berbera, Bulhar, and Zeyla. The scholars are not registered, and are allowed to attend as they choose. The reported attendances are:—

Berbera	Scholars	88	—Percentage of daily attendances	78·40
Bulhar	,,	66	,, ,, ,,	48·00
Zeyla	,,	48	,, ,, ,,	25·00

The teaching consists in the reading and writing of Arabic only. The schoolmaster's house does not act as a residence for the pupils. No routine examination of the pupils for enlarged spleens is conducted, nor is the school used as a centre for the distribution of quinine, these measures being found to be unnecessary on the Somali Coast.

LABORATORIES.

A small room is available at the hospital at Berbera for the purpose of blood examination, urine testing, &c. No culture equipment exists, but microscope sections can be cut and mounted, and simple chemical analysis conducted.

MUNICIPAL AND TOWN COUNCILS.

A Municipal Council was formed during the year. In the absence of H.M.'s Commissioner on leave, however, want of funds to conduct any of the projected works precluded any great improvements. Street lighting in the native part of the town of Berbera has been begun, and is fairly adequate.

THE MEDICAL SERVICE.

There are two medical officers, assisted by three sub-assistant surgeons, these latter having received their qualifications in India. Somalis are employed as hospital servants. There are no special health officers or registered medical practitioners.

A census of the population of the towns was taken during 1911 for the first time. The total Somali population is unknown, but is probably about stationary. The country in its present uncultivated state is capable of supporting only a limited population. The birth-rate on the coast is estimated at 10 per cent. among the married women.

VITAL STATISTICS.

	Europeans and Whites	Somalis	Indians	Arabs	Mixed	
Number of Inhabitants in 1910	20	300,000	200	300	100	Approximate
,, Births in 1911	1	—	—	—	—	Unknown
,, Deaths in 1911	2	—		—	—	Unknown
,, Immigrants in 1911	3	—	—	—	—	
,, Emigrants in 1911	4	—	—	—	—	
,, Inhabitants in 1911	18	300,000	634	1,857	350	
,, Increase	—	—	—	—		
,, Decrease	2	—	—	—	—	

Colonial Medical Reports.—No. 58.—Somaliland Protectorate (*continued*).

PUBLIC HEALTH.

DEATHS.

District		Area		Population
Berbera	..	900 square miles	..	20,000
Bulhar	..	300 ,, ,,	..	15,000
Zeyla	..	900 ,, ,,	..	15,000

Total deaths 1,262.

These figures are the only ones available, there being no record, except of those who have died in the Government-provided hospitals. Native reports as to the virulence and mortality from small-pox in the interior would tend to a belief that some 3,000 persons must have perished. The general state of the public health is not as good as last year. Apart from the small-pox epidemic, tribal fighting in the Interior, and an increase of the paupers on the coast, have acted detrimentally on the public health. Sexual diseases and destitution appear on the increase.

During the year medical history sheets have been instituted. These records, which are of a confidential nature, have been provided to every officer, on which a record of any illness is to be recorded for the use of his future medical adviser. The measure has not been received with any degree of popularity. I have, in fact, been approached with the request to allow my professional services to be rendered as to a private patient, and also that former illnesses, of which no record exists, are not included. In simple fact many people resent any record being kept, except in their own and their personally chosen doctor's memory. As a medical man I am not surprised.

During the summer an outbreak of rinderpest spread among the cattle in the Interior; no reliable data, however, came to hand, beyond a certified case in an animal introduced from this country which reached Aden, and was seen twenty-four hours after leaving Berbera. Funds at the disposal of the Municipal Council do not permit of the proposal at the present time of the appointment of a qualified stock inspector and overseer of abattoirs, and it may be regarded as fortunate that it is seldom that fevered meat is sold for consumption among the small European community.

The Municipal Council, brought into existence during the year, has performed such works as lay in its power for the best general public good. The measures carried into effect, although not those nearest the heart of a medical officer of health, were compatible with common sense and a realization of a large pauper population. Finances did not allow of any ambitious proposals being carried into effect. Everything done did, in fact, accomplish two benefits. The works were as follows: Clearing the town of drifted sand, which also gave employment to unskilled labour. Street lighting of the native town, which was in total darkness formerly, which may assist the police and enable them more easily to perform their duties. Reclamation of the foreshore with the sand removed from the town, which, in conjunction with a shifting of the sites of some of the native huts in an opposite direction, has helped to open up a too congested area.

The prevalence of sickness at different seasons is for this country not particularly easy to elucidate. The factors causing this difficulty are, that only those who are in urgent need are brought to the hospitals; the native population as a whole have shifted into the far interior of the country, except those engaged with definite local duties. This statement applies for the whole of the summer months. Secondly, the intense heat of the summer has a great influence on diet. No fresh vegetables whatever are obtainable. Feeding by day is uncommon, owing to the dense dust continually in the air. Factors such as these leave the fact, however, that no mosquitoes or flies are to be found, even in likely corners, during those months, and malarial fever is exceptional, except among those taking unboiled goat's milk.

The relative mortality at the different seasons: Here the physical conditions of the summer show a very definite strain upon the general body-weight and mental strength of all the Europeans. A single case of suicide during the last summer among the small community required prompt action to prevent a second case occurring under the conditions of physical discomfort and inability to obtain sleep owing to the heat.

Investigations made during the year relative to the presence of *Filaria nocturna*, and the anæmia occurring during the summer, have, I regret to say, been without conclusive result, owing to the interruptions caused by having to attend to the working and all operations at three hospitals, 150 miles from the base, with no skilled assistance.

MALARIA AND MALARIAL PROPHYLAXIS.

Intermittent malarial fever, admissions to hospital, 40; deaths in hospital, 0; cases treated at dispensaries, 1,342.

Remittent malarial fever, admissions to hospital, 40; deaths in hospital, 0; cases treated at dispensaries, 271.

There have been no legislative works passed on the subject during the year, and it may be noted that no deaths have occurred. Inspections and advising thereon are carried out and meet with unopposed compliance where no actual expense is incurred.

Public works connected with this subject have consisted in repairs and renewal of water tank drainage. Private enterprise has resulted in part of the hospital at Berbera and one bungalow being screened with gauze, the example of which looks likely to be followed for its saving annoyance against house-flies. The gauze found most suitable is of phosphor-bronze, 32 in. standard measure, sixteen to the inch mesh.

The examination of all persons suffering from malaria for enlargement of the spleen is conducted as a routine practice. There have been no recorded cases of permanent enlargement at any of the hos-

pitals. During the present year careful search is being made with reference to *F. nocturna*.

Quinine distribution is conducted from the hospitals only. A single full dose is occasionally sent out in less than 1 per cent. of the cases to as far as may be ascertained genuine patients. The reason for these restrictions is the seriously large number of native quack practitioners. Constant care and guard are required at all the hospitals to combat the theft of drugs and instruments.

It has not proved practicable to undertake any definite routine examination of the school children, but the native schoolmasters have, after explanation, done some good work by impressing upon the children the causation of malaria, and the necessity for killing all mosquitoes and larvæ. The actual knowledge of the causation is widely recognized among the people, and the diagrams distributed to the mosques and schools have proved of much service in connecting up the knowledge of larval forms, with the necessity for their destruction.

No cases are reported of blackwater fever, yellow fever, filarial disease, or dengue.

Teaching of Hygiene.

The above statement, namely, that the native schoolmasters have willingly undertaken to show and explain to their scholars the simple explanatory drawings of the life-cycle of the mosquito, and its importance as regards malaria, is something. Hygiene among nomadic tribes is not easy to teach. One is met on most points by the simple rejoinder that in the case of all sickness it is a simple affair, if that spot seems unhealthy, to drive the herds elsewhere. With a dry heat of 114° F. in the shade, and smoking with balsam, infected clothing seems to rapidly lose its infective power in a single day's exposure to such treatment. Hence, after studying the effectiveness of native methods already in vogue, I have found it more useful to impress the importance of cleanliness, &c., necessary for the healing of wounds. This has had a good effect, and the idea is gaining ground.

Vaccinations.

The number of vaccinations performed during the year was 4,481. Nearly all these have been performed from lanolated calf lymph, sent out from England in cold storage. The vast majority of these cases were among emigrants. Local regulations insist on all emigrants being vaccinated. The adoption of this measure has been found useful, the population as a whole being strongly conservative to a method of mild inoculation practised among themselves, which will take much time to overcome.

Special Diseases.

Small-pox.—This disease has raged in epidemic form during nearly the whole year at two of the three coast towns. It has proved extremely difficult to stamp out, being constantly renewed from the Interior, where no measures can be conducted at the present time owing to tribal disturbances.

The difficulty of preventing the spread of this disease has been in a measure benefited by the adoption of paper "blankets" at the small-pox camps. These are cheap, easily destroyed, and even to the native hardly worth stealing.

A matter of considerable interest is that of a native report, communicated by H.M.'s Commissioner, Mr. Byatt, to the effect that over a wide range of country in the Interior, known to afford shelter to a large number of the grey baboon, numbers of these monkeys have been found dead and showing signs of having become infected with a condition which at least resembles small-pox. It is much to be regretted that no actual inspection was practically possible.

Skin Diseases.—The large number of these cases is due to scabies.

Sanitation.

A permanent water supply brought from springs through pipes exists at Berbera. The other towns depend on wells which are liable to shifting and to become brackish on occasion.

Quarantine.—A quarantine station, consisting of a building containing a Clayton disinfector machine and a room for the disinfection to take place in, is available. The machine is worked by a small oil engine.

Climate.

The effect of the climate with regard to sickness has received attention under the heading of public health, but I would add that, with the exception of nerve exhaustion from want of sleep, owing to the heat in summer, the climate itself is not unhealthy. Ladies of fairly robust mind seem as well able to stand even the summer as well as the men. I should caution, however, against any European of either sex, being under 25 years of age, remaining for more than twelve months at a time, as exposure in direct sunlight over a quite short daily routine is always followed by loss of energy.

Appendix.

Notes on Native Somali Drugs and Remedies.

One of the most frequent traits of character in the Somali, with which I am brought into contact, is his antonishing love for experimental therapeutics and amateur surgery. Somalis lend themselves to experiment or to be experimented on by their fellow-kind to an extent that astonishes a European.

My attention was first drawn to the subject by the number of deaths which this procedure resulted in. As a result of the inquiry into the subject I am able to submit a list of the more active of the drugs in use, with a few notes on them. Most of these drugs will shortly be made the subject of careful analysis, which it has been impossible to conduct on the spot. Their activity, however, has been already ascertained. It cannot, however, be claimed that the list given below is the complete list of pharmacopœia of the country,

Return of Diseases and Deaths in 1911 in the Civil and Military Hospitals, Somaliland.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—
Anæmia	42	—	42
Anthrax	—	—	—
Beriberi	9	—	9
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	4	—	4
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	186	—	186
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	340	—	340
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	614	—	614
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	—	—	—
(b) Anæsthetic	—	—	—
(c) Mixed	—	—	—
Malarial Fever—	—	—	—
(a) Intermittent	1382	—	1382
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	280	—	280
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	2	—	2
Malignant	—	—	—
Old Age	—	—	—
Other Diseases	17	—	17
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	760	—	760
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	127	—	127
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	2846	1256	2846
Syphilis	—	—	—
(a) Primary	80	—	80
(b) Secondary	108	—	108
(c) Tertiary	57	—	57
(d) Congenital	—	—	—
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	60	3	60
(a) Phthisis Pulmonalis	—	—	—
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
General Diseases—*continued.*			
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—
LOCAL DISEASES.			
Diseases of the—			
Cellular Tissue	242	1	242
Circulatory System	4	—	4
(a) Valvular Disease of Heart	—	—	—
(b) Other Diseases	—	—	—
Digestive System—	3414	—	3414
(a) Diarrhœa	—	—	—
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(d) Abscess of Liver	—	—	—
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	—	—	—
(g) Cirrhosis of Liver	—	—	—
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	—	—	—
Ear	482	—	482
Eye	778	—	778
Generative System—	—	—	—
Male Organs	46	—	46
Female Organs	45	—	45
Lymphatic System	19	—	19
Mental Diseases	—	—	—
Nervous System	380	—	380
Nose	—	—	—
Organs of Locomotion	111	—	111
Respiratory System	1619	1	1619
Skin—	1556	8	1556
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	—	—	—
(d) Favus	—	—	—
(e) Eczema	—	—	—
(f) Other Diseases	—	—	—
Urinary System	10	—	10
Injuries, General, Local—	2	—	2
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	1470	1	1470
Parasites—	19	—	19
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	467	—	467
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations			
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

but may rather be described as that of drugs obtainable without great difficulty.

The following are a list of these drugs:—

Mawa (cortex of true root).—(1) Used for blistering. When fresh it is sliced and placed on the part. If in a dried state it is first moistened with water before applying. (2) Mixed with other drugs it is burnt like incense as a preventive against illness in the case of very young children or infants.

Tiera (a root).—Used as an alterative and blood tonic. The root is pounded and added to soup or tea. The taste is strongly bitter.

Woub (a bark).—About an ounce is taken of the pounded bark and mixed with soup. This is given singly or mixed with equal quantity of gag-a-bood for pneumonia.

Gorgen (obtained from the Habashi country).—Twenty to thirty of the seed-like bodies are pounded and given in soup for gonorrhœa. The action on the kidneys seems responsible for its use. It is given indiscriminately for all pains in the back.

Gaat (leaves of shrub).—The plant is grown in Abyssinia and Arabia, and is used both fresh and dried. Considerable trouble is taken to keep the leaves fresh. This is accomplished by partial drying after picking the shoots, which are later revived as required by placing them in damp cloth or cotton bags. The young leaves, which are slightly bitter and astringent, are chewed, as well as the young green stem shoots. The drug has a powerful action in warding off hunger and muscular fatigue, as well as acting as a stimulant where work precludes sleep being taken. It seems specially active in action the higher the temperature is in which the person has to work (running in a temperature of 120° F.).

Gag-a-bood (a root).—(1) Pounded and placed in a muslin bag the drug is kept immersed in the drinking water of phthisical patients. (2) It is occasionally used as an appetizer.

Habuk-har (a gum).—Used as a purgative. A lump the size of the terminal joint of the thumb is given. Found to be very drastic.

Assal (a bark).—Pounded and mixed with hot water is used as a lotion for wounds. It is carefully skimmed and kept on the fire some time before being actually used. (2) It is also used as a red dye for skins.

Doncal (a gum?).—A strong poison, about 1½ dr. sufficient to kill a man. Obtained from a tree named Hodie.

Habuk-damus (a gum?).—Sucked, or the vapour obtained by heating is inhaled for sore throat or for colds.

Hangu-beyu.—An aromatic incense used for fumigation.

Ood.—An aromatic incense used especially for clothing. Described as coming from the very far Interior. Value of sample 2d. Is difficult to obtain and is much prized.

Habuk-hodie.—Dissolved in water and used as a paste for boils. Action much resembles that of iodine.

Wabi.—The root is boiled down and then evaporated to a paste. Is a very powerful, rapid poison, used as a spear and arrow poison.

METEOROLOGICAL RETURN FOR THE YEAR 1911.

	Temperature						Rainfall		Winds		Remarks
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force	
January	121	66	92	70	22	81	·45	68	N.E.	2	
February	117	67	90	69	22	79·5	·41	67	N.E.	4	
March	113	73	92	75	17	83·5	2·25	72	N.E.	2	
April	118	74	94	76	18	85	2·75	68	N.E.	2	
May	132	76	101	81	20	91	—	59	N.E. & S.W.	2	
June	130	84	110	86	24	98	—	42	S.W.	7	
July	115	86	106	89	17	97·5	—	34	S.W.	4	
August	111	84	105	88	17	96·5	—	36	S.W.	4	
September	117	84	102	85	17	93·5	—	47	S.W. & N.E.	3	
October	115	76	90	78	12	84	2·35	68	N.E.	3	
November	116	72	85	71	14	78	—	72	N.E.	2	
December	119	68	83	69	14	76	1·56	76	N.E.	3	
Mean for year ..	119	76	96	78	18	87	·79	59		3	

Colonial Medical Reports.—No. 59.—Demarara.

MEDICAL REPORT FOR THE YEAR 1912.

By J. E. GODFREY.

Surgeon-General.

ESTIMATED population (1912), 299,044; births (1912), 9,894; deaths (1912), 8,727; birth-rate per 1,000 (1912), 33·1; (1911) 28·8; death-rate per 1,000 (1912), 29·2; (1911) 31·7.

The relative mortality in the different quarters was: March quarter, 2,336; June quarter, 2,257; September quarter, 2,228; and December quarter, 1,906.

Bowel Complaints (including dysentery, diarrhœa, and enteritis) were responsible for the largest number of deaths. The quarterly returns of deaths from the causes in this group were 440, 460, 369, and 216 respectively; total, 1,485.

Fevers (*Malarial and others*).—This group shows the next highest number of deaths; the quarterly returns of deaths being 359, 318, 402, and 312 respectively; total, 1,391.

Pneumonia and Bronchitis.—The quarterly deaths in this group were 297, 268, 243, and 203 respectively; total, 1,011.

Kidney Diseases.—The mortality in this group was 189, 191, 181, and 184 respectively; total, 745.

Diseases of Early Infancy (including premature birth, infantile debility, icterus, and sclerema).—There were 162, 181, 160, and 196 deaths in each quarter respectively; total, 699.

Phthisis and other forms of Tuberculosis showed the following number of deaths in each quarter respectively: 138, 136, 135, and 146; total, 555.

METEOROLOGICAL RETURN FOR THE YEAR 1912.

	Temperature						Rainfall	Wind		Remarks
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean *	Amount in inches	General direction	Average force	
January	147·0	70·5	85·6	74·3	—	—	1	N.E.	3	
February	151·9	71·6	86·7	74·1	—	—	—	,,	3	
March	149·6	73·4	86·1	75·4	—	—	1	,,	3	
April	152·5	73·6	87·0	76·0	—	—	6	,,	2	
May	141·2	72·4	85·8	76·3	—	—	9	,,	2	
June	146·0	71·4	84·7	75·2	—	—	8	,,	2	
July	142·7	70·8	84·7	74·9	—	—	11	S.E.	2	
August	148·0	72·2	86·0	75·4	—	—	8	N.E.	2	
September	150·4	72·8	88·0	75·7	—	—	2	,,	2	
October	150·9	72·4	88·4	76·4	—	—	2	,,	2	
November	146·4	72·3	87·2	75·6	—	—	4	,,	2	
December	139·8	72·0	85·1	74·6	—	—	16	,,	2	
Total	1,766·4	865·4	1,035·3	903·9	—	—	68	—	27	
Mean	147·2	72·1	86·3	75·3	—	—	—	—	—	

* Taken in the shade.

Return of Diseases and Deaths in 1912 at the following Institutions:—

Public Hospitals, Georgetown, New Amsterdam, Suddie, Bartica, and North-western District.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	22	—	22
Anæmia	159	7	159
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	460	134	460
Chicken-pox	63	—	63
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	278	90	278
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	1
Diabetes Insipidus	1	1	1
Diphtheria	5	2	5
Dysentery	8	—	8
Enteric Fever	2	1	2
Erysipelas	9	—	9
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	245	—	245
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	142	—	142
Kalar-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	1	—	1
(b) Anæsthetic	12	—	12
(c) Mixed	—	—	—
Malarial Fever—	—	—	—
(a) Intermittent	1387	62	1387
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	18	1	18
(c) Pernicious	24	10	24
(d) Malarial Cachexia	22	3	22
Malta Fever	—	—	—
Measles	6	—	6
Mumps	7	—	7
New Growths—	—	—	—
Non-malignant	58	1	58
Malignant	58	11	58
Old Age	—	—	—
Other Diseases	33	8	33
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	12	10	12
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	354	2	354
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	45	41	45
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	77	2	77
(a) Primary	12	—	12
(b) Secondary	51	—	51
(c) Tertiary	105	9	105
(d) Congenital	13	5	13
Tetanus	29	13	29
Trypanosoma Fever	—	—	—
Tubercle—	53	16	53
(a) Phthisis Pulmonalis	—	—	—
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
General Diseases—*continued.*			
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	4	1	4
Yaws	37	2	37
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	826	21	826
Circulatory System	289	63	289
(a) Valvular Disease of Heart	—	—	—
(b) Other Diseases	—	—	—
Digestive System—	1456	189	1456
(a) Diarrhœa	—	—	—
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(d) Abscess of Liver	—	—	—
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	—	—	—
(g) Cirrhosis of Liver	—	—	—
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	—	—	—
Ear	33	—	33
Eye	316	—	316
Generative System—	—	—	—
Male Organs	523	3	523
Female Organs	1936	109	1936
Lymphatic System	129	—	129
Mental Diseases	177	3	177
Nervous System	261	47	261
Nose	17	—	17
Organs of Locomotion	228	3	228
Respiratory System	1959	491	1959
Skin—	655	4	655
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	—	—	—
(d) Favus	—	—	—
(e) Eczema	—	—	—
(f) Other Diseases	—	—	—
Urinary System	832	232	832
Injuries, General, Local—	663	11	663
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	602	63	602
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	24	—	24
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	6354	54	6354
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

Colonial Medical Reports.—No. 60.—Shanghai.

MEDICAL REPORT, SHANGHAI, FOR THE YEAR 1912.

By ARTHUR STANLEY, M.D., B.S.Lond., D.P.H.

Health Officer.

THE past year was not a healthy one. There was a considerble increase in the incidence of acute diarrhœa, typhoid fever, and scarlet fever—all preventible diseases. But the augmented death-rate was, in the case of the foreign population, due, to some extent, to increased mortality among children from general causes, such as bronchitis; the incidence being mainly among Japanese. The increased Japanese population has introduced a new element into the composition of the foreign community, which now resembles that of a home industrial city. In the past the foreign community consisted largely of people in more or less affluent circumstances, but now the greater number correspond to the poorer class of a European city, the children of whom contribute extensively to the death-rate. For this reason, although there may be a gradual improvement in sanitary conditions, any notable lessening of the death-rate is improbable until the community has arrived at a fixed composition.

The Sub-district Health Offices, sixteen of which are now scattered through the Settlement, have proved of the greatest value in practical sanitation. Each section of about 30,000 of the population now has a Health Office in miniature in charge of a foreign assistant sanitary inspector, where vaccination is done at stated times and many other benefits of modern sanitation are available for the public, foreign and Chinese. The Chinese are beginning to voluntarily report cases of preventible disease and deaths, and, with the general employment of the medical practitioner educated on modern lines, these subsidiary Health Offices will make the application of such modern sanitary measures as it has not yet been possible to organize a comparatively easy matter. When, for example, small-pox has been stamped out by bringing free vaccination almost to the doors of the people, it will be possible to attack the greatest of all modern health problems, the prevention of tuberculosis. In the near future the Chinese public will probably learn the necessity for calling in medical practitioners to recognize cases of infectious diseases, such as scarlet fever and diphtheria, and may then better understand the need for isolation in order to prevent these diseases. Patience is, however, required. The full benefits of modern sanitation are applicable only to a community ready to receive them. They cannot be forced upon a reluctant people. The Chinese must be gradually educated up to the standards of modern municipal life. The past fifteen years has seen in Shanghai a gradual building up from very small foundations of the fabric of modern sanitation, and we are now at the half-way house.

The incidence of choleraic diarrhœa affected the community seriously; for not only were the number of cases, both among foreigners and Chinese, exceptionally high, but the Port was declared infected with cholera by the Japanese authorities. In the absence of the cholera organism, the disease was not officially recognized as cholera, but, as the method of prevention of these maladies is the same, it matters little by what name it is called. It is felt that unless more stringent action is taken against the hawking of fruit, sliced melons and other foodstuffs which carry the infection, a large preventible loss of life will be liable to occur annually. Until the sale of fresh foodstuffs is confined to municipal markets and licensed shops, the summer incidence of severe diarrhœa, often fatal, and clinically resembling cholera, is calculated to kill extensively. The deaths from this trouble occur chiefly among the very poor, who live from hand to mouth, deriving much of their sustenance from itinerant hawkers, whose fly-infected stock-in-trade is an obvious danger. The need for further action has been annually pointed out; but there has been an objection to interfering with the old customs of the wharf and other coolies, the main sufferers, who, during the hottest weather, are decimated as a result of eating fly-infected food bought from the basket men. These coolies are unable to take care of themselves in respect to their food, so that it would appear necessary for the Health Office to be empowered to safeguard them as far as possible. The placing of the port in quarantine is a serious disability to trade, and it appears necessary to face the question squarely and decide whether it is not advisable to deprive the wharf coolies of their usual supplies so as to enable them to take their food under proper sanitary conditions. The presence of these food hawkers on the wharves, where they sell infected food to passengers, is also the main source of the cases of sickness among the steerage passengers which are the cause of quarantine restrictions being imposed.

VITAL STATISTICS.

The Foreign Population of the Settlement north of the Yangkingpang, including the outside roads and Pootung, at the last census taken on October 15, 1910, was 13,536, and consisted of 6,293 men, 4,172 women, and 3,071 children. The foreign shipping population, which numbered 1,755, was not included. The foreign population for the middle of 1911 was calculated at 14,000. The census of the foreign population taken at each quinquennial period since 1870 shows the following expansion: 1,666, 1,673, 2,197, 3,673, 3,821, 4,684, 6,774, 11,497, 13,536.

The Native Population on October 15, 1910, was 488,005, and consisted of 227,175 men, 129,924 women, and 130,906 children. The Chinese popu-

lation for the middle of 1911 was calculated at 500,000. The census of the Chinese population taken at each quinquennial period since 1870 shows roughly the following expansion: 75,000, 96,000, 108,000, 126,000, 168,000, 241,000, 345,000, 452,000, 488,000.

Deaths among the Resident Foreign Population.—During the year 1912 the total corrected number of deaths registered among foreigners, including non-Chinese Asiatics, was 343; of this number 294 occurred among the resident population.

Six months spent continuously in Shanghai is taken to constitute residence as in former reports. As the non-resident population is a variable and indeterminate factor, the deaths in this category are eliminated in the calculation of the death-rate. The death-rate per thousand per annum, therefore, calculated from 294 deaths occurring among the resident foreign population of 14,000, is 21, as against 16·8 in 1911. The deaths of 102 children (persons under 15) have been registered, as against 73 last year; of the deaths among adults, 120 were men and 72 women; of children, 51 were boys and 51 girls. The mean age at death among the adult resident population was 41·5.

Small-pox, the most obviously preventible of all diseases, levied a toll among the unvaccinated.

Scarlet fever, which killed so many in 1902, shows signs of increased prevalence.

Tuberculosis heads the list of fatal diseases, both among foreigners and Chinese, and the prevention of this disease offers a fine field for future work.

Alcohol has been responsible for the deaths of ten foreign residents during the year.

Lobar pneumonia, which nine years ago assumed almost epidemic proportions, caused four deaths.

Beriberi is now a frequent cause of death among foreigners on account of the increased Japanese population.

Plague-infected rats were found in diminished numbers.

Among the non-resident population the chief causes of death were acute diarrhœa, drowning, tuberculosis, small-pox, typhoid fever, and dysentery.

Deaths among the Native Population.—9,663 deaths among the Chinese have been reported, compared with 6,799, 8,156, and 8,329 in the three preceding years.

The death-rate per thousand per annum is 19·3. There were 124 deaths from small-pox, as against 156 last year. Both scarlet fever and diphtheria show increased prevalence. Of the deaths, 5,318 were males and 4,345 females. The deaths of 3,993 children (persons under 15) have been registered; of these 2,107 were boys and 1,886 girls.

METEOROLOGY OF SHANGHAI.

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Year 1912
Barometer.													
Mean inches ..	30·394	30·180	30·158	30·030	29·845	29·641	29·670	29·717	29·922	30·135	30·279	30·388	30·0299
Departure from average ..	+0·076	−0·104	−0·012	+0·025	−0·028	−0·096	−0·012	−0·007	+0·016	+0·030	+0·036	+0·079	+0·0002
Temperature.													
Mean degree ..	36·86	43·20	46·22	57·92	66·83	74·77	80·96	79·90	71·20	62·70	48·74	41·60	59·242
Departure from average ..	−0·99	+4·11	+0·22	+1·80	+1·35	+1·51	+0·61	−0·36	−1·80	−0·64	−3·19	−0·48	+0·178
Daily Range of Temperature.													
Mean degree ..	14·96	18·09	13·32	20·84	18·63	17·03	16·72	14·72	16·[illegible]0	19·59	18·98	14·34	17·01
Departure from average ..	+1·87	+4·48	−1·10	+4·80	+0·90	+1·62	+1·44	−0·63	+1·22	+2·56	+1·32	−2·42	+1·45
Degree of Humidity.													
Mean (Saturation—100) ..	77·7	77·5	80·4	75·5	78·0	83·9	85·8	86·1	82·2	80·2	78·3	80·6	80·517
Departure from average ..	−1·8	−1·1	+0·9	−4·7	−1·8	−0·3	+1·6	+1·8	−1·1	+0·5	+0·7	+4·4	−0·075
Rainfall.													
Amount in inches ..	1·72	1·49	4·65	3·70	2·78	11·71	8·57	10·17	2·13	1·85	2·10	1·23	52·10
Departure from average ..	−0·50	−0·75	+1·11	−0·02	−0·82	+4·96	+3·01	+4·44	−2·45	−1·51	+0·29	−0·04	+0·646

The above figures have been kindly furnished for this report by Father Froc, Director of the Siccawei Observatory.

INFECTIOUS DISEASE.

Notification.—In the absence of legal obligation to notify, an arrangement has been made between the Municipal Council and the qualified medical practitioners of Shanghai requiring notification of infectious disease for the facilitation of preventive measures, in consideration of the use of the resources of the Public Health Laboratory for the purposes of pathological diagnosis and the payment of a fee of one tael for each case. The notifiable diseases are: small-pox, cholera, typhoid fever, typhus fever, diphtheria, scarlet fever, tuberculosis, plague, anthrax, glanders, leprosy, and hydrophobia. Tls. 367 was paid for notification fees, as against Tls. 385 and Tls. 110 in the two preceding years.

Colonial Medical Reports.—No. 60.—Shanghai (*continued*).

The system of notification, so far as it goes, has worked well. Chinese cases are beginning to be usefully notified by Chinese practitioners educated according to the foreign standard.

During the year 113 bills of health for ships and cargoes were issued, as against 147 in the previous year.

Weekly returns of infectious disease have been exchanged so as to get in touch with the sanitary condition of places in the Far East in communication with Shanghai.

Isolation.—Isolation for cases of infectious disease among foreigners and Chinese is provided in the Isolation Hospital, Range Road.

Disinfection.—7,122 rooms were disinfected, as against 1,936 and 2,162 in the two preceding years; 103,550 articles have been disinfected by steam, compared with 80,575 and 107,288 in the two preceding years; 29,704 articles were disinfected by formalin, compared with 24,856 last year. The Disinfection Station adjoins the Isolation Hospital. Prior to disinfection each disinfector dons a sterile overall. The general method of disinfecting in a house after a case of infectious disease is firstly to remove to the station everything that can be disinfected by steam; then to spray and wash walls, floors, fittings and furniture with disinfecting solution (cyllin). Fragile and delicate ware, such as bonnets, books and photographs, are disinfected by formalin. In many cases, such as after typhoid fever or diphtheria, disinfection of walls, &c., is not considered always necessary, the washing with disinfectant being then limited to articles that have been actually in contact with infected material. After disinfection, painting or colour-washing of walls and ceiling is advised to be done by the occupier before the room is again occupied, without which no responsibility can be accepted by the Health Office.

SMALL-POX.

The incidence of small-pox was considerable. Twenty cases were notified among the resident foreign community, of which three were fatal. Among the Chinese there were 124 deaths from small-pox, as compared with 156, 304, 19, 143, and 863 during the preceding five years.

Small-pox is the typical preventible disease, and its presence or absence is an index of the hygienic education of a community. In Shanghai the Chinese are beginning to appreciate the benefits of vaccination as opposed to inoculation, which they have practised with little benefit for hundreds of years and which is now illegal in almost all civilized countries.

Vaccination is done free for all Chinese and indigent foreigners applying at the Sub-district Health Offices. Vaccine is also supplied free to the Chinese hospitals in Shanghai. 6,108 vaccinations have been done by the Health Office during the year, as compared with 465, 380, 520, 1,418, 4,649, 3,244, 4,608, and 4,933 in previous years.

There is no doubt that vaccination repeated until it no longer takes always prevents small-pox. The criterion of efficient vaccination is inability to be vaccinated. In Shanghai there exists so much small-pox infection that vaccination should be repeated every three years until it no longer takes. Where previous good vaccination is not shown by white net-like scars, aggregating at least one square inch in area, particular care should be taken to get efficiently vaccinated.

The first principles of vaccination came from the East and thereon rests the basis of modern preventive medicine. The Chinese practised inoculation of mild small-pox as a protection against severe small-pox long before the days of Jenner. It is therefore probable that the Chinese will take up vaccination widely.

CHOLERA.

Acute diarrhœa of choleraic type was prevalent from July to September, affecting severely both foreigners and Chinese. In none of the numerous cases examined, with the exception of a case introduced from Sungkiang, was the characteristic cholera organism found after repeated and extended examination in the Laboratory. Not only were vibrios of any kind remarkable for their absence from the stools of these cases, but such as were discovered showed no agglutination with a specific cholera serum. Though the disease was not recognized as Asiatic cholera in the absence of the cholera organism, cases were notified as cholera by practitioners, and cases brought to Japanese ports on ships from Shanghai were declared to be cholera and quarantine restrictions imposed.

Attention was directed to the need of personal care in preventing the group of bowel diseases characteristic of life in Shanghai, which includes cholera and allied conditions, typhoid fever and dysentery and allied conditions. The same methods of prevention apply to all, namely, to eat and drink nothing that has not been recently boiled or cooked or otherwise sterilized.

Living in an alien country, the only sure way of securing purity of food is by sterilization. Sterilization may be accomplished best of all by heating to boiling point, as by cooking and boiling. The Berkefeld filter sterilizes water, provided the filter candle be boiled once a week at least. Canned goods, including butter, are necessarily sterilized during the process of canning, otherwise they would not keep. Bottled beverages of good reputation are practically devoid of dangerous bacteria. Ice is not sterile and should not be put into drinks. Fresh fruit, tomatoes, melons, &c., may be effectively sterilized, without spoiling the flavour, by immersion for a few seconds in boiling water, any infection that may be present being invariably on the surface, provided the fruit be sound.

If the simple rule be observed of eating and drinking nothing that has not been recently cooked or boiled, or otherwise sterilized, it is practically impossible to contract any of those bowel troubles to which the Shanghai resident is especially prone. When this fundamental fact is grasped, "chills,"

"livers," and "cholera belts" will cease to be considered matters of importance.

Typhoid Fever.

The fatality of the disease, now that paratyphoid fever and Malta fever are less frequently included, approaches the true type. In nearly all cases where the origin was investigated obvious breaches of the ordinary rules of health, as laid down in the Public Health Notice, were observed.

The infection of typhoid fever may be conveyed by vegetables and oysters which have been contaminated with infected ordure, by water, by milk contaminated with infected water, through the air by means of infected dust, and directly from persons suffering from the disease or who act as "typhoid carriers" subsequent to recovery. Typhoid fever is a preventible disease, its prevention being largely a matter of individual care.

The cause of typhoid fever is practically always taken into the body with infected food, and the foods most commonly infected are vegetables, by reason of the manner in which they are grown. Especial stress should be laid on the fact that vegetables are frequently the source of infection with typhoid fever, cholera, dysentery and other forms of diarrhœa, and particular care should be given to their thorough cooking, and separation before cooking from the rest of the food.

Measles.

There was an outbreak of measles, remarkable for its infectivity and severity, from November, 1911, till April, 1912. There were three fatal cases among foreigners and 373 among Chinese. As bearing on this subject it may be noted that a similar epidemic visited the Philippine Islands about four months earlier. The severity of the disease was much greater than usually encountered and was attributed to the introduction of a new strain of virus by transports from the United States: it was, in fact, decided to make it quarantinable.

Diphtheria.

The incidence of this disease has not been marked, and the case fatality has been small. Diphtheria antitoxin is supplied free to indigent patients in Shanghai on the recommendation of the physician. In any case of suspected diphtheria, antitoxin should be given at once, without waiting for the result of the bacterial diagnosis.

Scarlet Fever.

The annual admission of foreign cases into the Isolation Hospital since 1902 has been 34, 7, 11, 11, 20, 70, 25, 9, 32, 22, and 64. Of these 305 cases 54 proved fatal, a case fatality of 16·7 per cent. as compared with a case fatality in England of under 5 per cent. The case fatality has not markedly changed since the introduction of scarlet fever into Shanghai.

Although scarlet fever has hitherto failed to establish itself firmly in any part of Asia, excepting Asia Minor, and is practically unknown in the Tropics, it appears to have come to Shanghai to stay. Scarlet fever was practically unknown in Shanghai prior to 1900, when it was probably introduced by foreign immigrants. As would be expected with a recently introduced disease, against which evolution has afforded no natural immunity, scarlet fever has been of a virulent type among the Chinese. It is probable that the passage of the disease through the susceptible Chinese has led to an intensification of the virus, so that it is more fatal to foreigners also.

Early notification, isolation and disinfection are especially necessary in dealing with such a fatal and infectious disease as scarlet fever is in Shanghai. The commonest mode of infection is from a previous case either by contact, by proximity, or by means of infected articles. The infection is given off by the breath in coughing and speaking, by the secretions of the mouth, nose, ear, and throat, and later by the peeling skin.

The incidence during the year was sporadic and indicates need for early isolation and disinfection to prevent an epidemic recurring among the vast mass of susceptible material which exists in the Settlement.

Tuberculosis.

The prevalence of tuberculosis remains at the same high level. The enormous death-rate is significant of local conditions of overcrowding, against which there is at present no legislation. The prevalence of tuberculosis bears little relation to climate but is common wherever man closely aggregates. It is probable that most cases of tuberculosis of the lungs are contracted by breathing the infected droplets ejected by infected persons during coughing, sneezing, and speaking.

Plague.

Plague-infected rats were found in December, 1908. A complete plague survey of the Settlement has been maintained since. During 1912, 14,988 rats were found dead and brought to the Laboratory for examination, and of these 95 were plague-infected, compared with 187, 249, and 138 during the three preceding years. During the year nearly 154,000 rats were trapped and burnt. These, with the rats found dead and examined for plague, brought the total number of rats visibly accounted for to 168,988. In addition to the trapping, close on six million phosphorus baits were laid, about a ton of poison being used, which proved a powerful method in dealing rapidly with infected foci. Poisoning on so large a scale carried with it certain risks, but since using poisoned cubes coloured bright blue instead of the usual method of spreading the poison on bread, no cases of adventitious poisoning have been reported. 1,597 houses, in plague foci, were temporarily rat-proofed and pulicidally disinfected; bedding, &c., being passed through the steam disinfector. This temporary rat-proofing included the plastering up of rat-holes, bricking up and wire-netting places permitting ingress of rats into houses; the furniture of the house being removed to permit of thorough examination for rat-holes and runs.

During October special inspection was placed on a part of the No. 2 Central Sub-District where six plague-infected rats occurred in rapid succession at a time when the remainder of the Settlement had been completely free from rat infection for three months. This same focus was previously infected in 1909 and 1910. The discovery of a human case of plague on November 2 was not, therefore, wholly unexpected and tended to confirm the extent of the rat infection and the efficacy of the present method of plague survey by daily examination for plague in the Laboratory of rats found dead in all the areas into which the Settlement is divided for sanitary purposes. Between November 2 and 19, seventeen cases of bubonic plague arose within an area limited by the Nanking, Fokien, Peking, and Shanse Roads. The first cases were discovered in the ordinary course of sanitary inspection and the disease confirmed by laboratory examination. The Director of the Chinese Public Isolation Hospital then offered, according to an arrangement previously made, to send his staff of Chinese doctors to carry out house-to-house inspection within the infected area with a view to the discovery of cases, isolation and treatment. The arrangement was carried out with cordial co-operation. On the occurrence of the first human case of plague the rat-proofing staff was concentrated on this area, so that by the end of the year 893 houses in the infected area had been permanently rat-proofed, over 200 men being, at one time, employed on this work. The average cost of rat-proofing these houses was $11. No further cases were reported in this area subsequent to December 19. The measures adopted were carried out with an almost complete absence of that sanitary hysteria which sometimes characterizes an outbreak of this dread disease. The inhabitants of the infected area showed no active opposition to the measures taken, a circumstance which was to some extent due to the lectures which were given in various parts of the infected area daily explaining the reason for the measures taken. There were rumours that the outbreak was one of pneumonic plague because of the occurrence of secondary pneumonic symptoms in some of the cases, and it was feared that the epidemic of pneumonic plague which broke out about this time two years ago in Manchuria might be repeated in Shanghai. The outbreak, however, conformed to the usual bubonic type. The conditions in Shanghai, though not making the occurrence of an epidemic of pneumonic plague impossible, through the overcrowding which prevails, are not comparable with the exceptionable conditions obtaining during the Manchurian winter.

A case of plague occurred on December 10, at 19, Yunnan Road, a place where plague-infected rats had from time to time been found. During subsequent rat-proofing operations three plague-infected rats were found in hollow ceilings and two below hollow floors.

As a result of the extensive rat-proofing operations in the Northern District during the last two years, some 5,265 houses being done, a gratifying reduction of plague-infected rats has resulted: during the last quarter of 1910 there were 126 plague-infected rats found, while during the same quarter of 1912 only 4 were found. An unsatisfactory circumstance at present attending plague prevention measures lies in the fact that new houses are being erected in accordance with the Chinese Building Rules, which, as they contain ceilings, afford ample facilities for rats to live and multiply within the houses and become a source of plague. Indeed, the first cases of the above outbreak occurred in an alley of new houses with solid ground floors, but which had ceilings. In the space enclosed by the lower ceiling, which was subsequently removed with the permission of the landlord, dead rats were found which had undoubtedly been the cause of the plague cases. The hollow space enclosed by the lower ceiling is a place much frequented by rats and one where they are the greatest danger through proximity to the beds of the occupants. There can be no question now that if Shanghai is to be kept free from plague, lower ceilings in Chinese houses should not be permitted except in special cases. A very large number of both upper and lower ceilings have been removed during the present year from old houses in plague-infected areas with scarcely any complaint except in the case of the upper ceiling. Property owners and architects are requested to inspect these houses where ceilings have been removed with a view to confirming the truth of these statements. If, as a result of this, the approval is obtained of an amendment of the Chinese Building Rules to omit the lower ceiling in the majority of Chinese houses a sanitary danger of the first importance will be removed.

A plague preventive measure of considerable permanent value has been the erection of rat-proof house refuse receptacles on Chinese property. A marked improvement in the cleanliness of alleys has resulted. It will be apparent that rats will thus be deprived of a vast store of nourishment; and, as the rat population is to a large extent regulated by the amount of the available food supply, this is held to be a radical plague preventive measure.

Although the initial cost of permanent rat-proofing is comparatively large, yet, if adequate building rules are promulgated and new houses built in accordance with the requirements of modern sanitation, not only will it be possible to gradually reduce to extinction the present large plague prevention staff, but this measure of permanently rat-proofing houses forms the greatest insurance against plague in the future and is, in fact, the only permanent safeguard. A house permanently rat-proofed is not only a healthier one to live in but is an almost certain guarantee against bubonic plague to the inmates.

Of the rats examined in the Laboratory, about 70 per cent. were *Mus rattus* and the remainder *Mus decumanus*—*rattus* being the black or ship rat, which usually lives in houses, and *decumanus* the brown or sewer rat. *Mus rattus* largely preponderated among those plague-infected. Of the fleas,

Pulex cheopis and *Ceratophyllus fasciatus* have been identified, the former being the flea usually associated with the spread of plague from rat to man.

In formulating anti-plague measures the rat has been the chief objective, as it is held that the rat is the essential cause of epidemics, the flea being the carrier of infection from rat to rat and from rat to man, infection from human cases, which is practically limited to the few pneumonic cases which usually arise, being comparatively rare. The dictum "No rats, no plague" has been taken as a working basis, and a house that is rat-proof has been considered for all practical purposes plague-proof.

Malaria.

A comparatively small number of cases of malarial fever, mostly of the benign tertian type, are contracted in and around Shanghai.

Periodic examination has been made of mosquitoes collected from each of the sanitary districts into which the Settlement is divided, and the following have been found: ***Anopheles sinensis*** (malaria-bearing), ***Stegomyia scutellaris*** (yellow fever bearing), *Culex fatigans* (the host of filaria), and *Armigeres ventralis*.

The prophylaxis of malaria resolves itself into (1) suppression of mosquitoes, (2) prevention of infection of man by mosquitoes, (3) prevention of infection of mosquitoes by man.

Every effort should be made by householders to do away with all receptacles of stagnant water, where mosquitoes breed, such as ponds, water-plants, drains out of repair, abandoned tubs, pots, tins, and what not. The mosquito net should be assiduously used whenever there are mosquitoes, and especially in up-country houseboat trips. It is doubly necessary to surround a person suffering from malaria with mosquito netting to prevent mosquitoes becoming infected and acting as carriers of infection.

Beriberi.

The incidence of beriberi among the municipal prisoners has diminished. The cause of this disease remains under close observation, though up to the present wrapt in obscurity. The evidence preponderates in favour of the disease being an infective one having no direct relation to food but infective through body vermin.

Dysentery.

Dysentery, with liver abscess as a not infrequent sequel, continued prevalent. It would appear that, unlike the type of dysentery prevalent in Japan, which is bacillary in origin, of relatively greater fatality and unattended by liver abscess, that which occurs in Shanghai is mostly amœbic in origin and prone to produce liver abscess. As regards prevention, the remarks made under cholera apply with equal force to dysentery.

Rabies.

Ten persons were bitten by rabid dogs within the Settlement during the year and subsequently underwent the Pasteur treatment. The virus of rabies in Shanghai dogs is of an exceptionally intense character, the period of incubation being shorter than the rabies met with in dogs in Europe.

Dengue.

From its home in the Malay Archipelago, dengue has frequently during recent years spread up the coast ports to Shanghai. It very rarely kills, but frequently incapacitates from work a large section of the community. It is an intensely infectious disease, spreading in mass like influenza, but appears not to be spread by contagion.

Relapsing Fever.

Relapsing fever again made its appearance among municipal prisoners. The examination in the Laboratory of the blood from certain fever cases has shown that relapsing fever is probably quite common among the Chinese population and occurs also to some extent among foreigners. This fever is much more prevalent in Shanghai than has hitherto been thought, a circumstance which may help in the future to clear up certain obscure cases of fever.

It is probable that infection is determined by the presence of body vermin, and measures which ensure their destruction will prevent the disease spreading.

Cattle Plague.

Cattle plague prevailed extensively in the dairies during the year. The mode of incidence appears to show that its origin is not in food, nor is the infection carried by the coolies, but that insects are the probable means of spread. Immunization by Koch's gall method is usually available from the Municipal Laboratory but seldom availed of. The ordinary preventive measures of isolating sick animals and thorough disinfection were carried out so far as possible.

Kölle and Turner's simultaneous method of immunization by virulent cattle plague blood and immune serum can be recommended as producing a greater degree of immunity than the gall method, but its application is more difficult and there may be some slight loss of cattle as a direct result. There can be no doubt that were dairymen to have their cattle thus immunized they would be saved great subsequent financial loss from epizootics of cattle plague.

Public Health Laboratory.

Inasmuch as the study of the life-history of pathogenic organisms must precede all adequate measures for preventing the diseases which they cause, no pains have been spared to develop the resources of the Municipal Laboratory. It is the centre of work of the Health Department. Its purposes have been the investigation of diseases met with in Shanghai, the diagnosis of infective disease, the preparation of preventive and curative remedies against these diseases, and the analysis of products bearing on the public health.

Colonial Medical Reports.—No. 60.—Shanghai (*continued*).

The matters which have been under investigation have been the causes of variation in virulence of small-pox vaccine, cholera antitoxic serum, the natural filtration of water through alluvium, the suitability of fruits and vegetables as media for the growth of certain pathogenic organisms, preventive inoculation against cattle plague, the causation of beriberi, the incubation period of the rabies in China, the prevalence of Malta fever and the natural disposal of organic matter in house refuse.

ANALYSES.

Milk.—456 samples of milk have been examined during the year and of these sixty-seven were returned as adulterated. In fifty-eight samples the nature of the adulteration was addition of water, the extent of adulteration being indicated in the following table:—

21 samples	contained from	1 to 10	per cent.	of added water.
9	,,	,,	10 to 20	,,	,,
12	,,	,,	20 to 30	,,	,,
7	,,	,,	30 to 40	,,	,,
4	,,	,,	40 to 50	,,	,,
5	,,	,,	over 50	,,	,,

Four of those which contained added water also contained starch, whilst starch was also present in five samples which were otherwise normal. In one specimen gelatine was present, a form of sophistication new to Shanghai. Cream had been abstracted from four samples.

A shortage in the milk supply, occasioned by loss of stock from cattle plague and an increased demand for milk on the part of the Chinese, may perhaps account for the increased adulteration. At the same time, it may be only fair to the dairyman to state that samples were taken from unlicensed as well as licensed dairies.

Bean Milk.—In view of the attention devoted to the soya bean it is of interest to note the introduction of bean milk to the Shanghai market. The food value of the soya bean has been known for years in China and Japan. On account of its high proteid content it is an important article of diet for people whose staple food is rice, a cereal very poor in proteid or nitrogen. For the preparation of bean milk, the beans are washed and soaked in water, the outer integuments being removed. The softened beans are then ground between millstones and the powder boiled with water and filtered through fine sieves or cloth. A cream-coloured liquid results which is a suspension of the oil and solids of the beans in water. It resembles milk in appearance but has a distinct "beany" odour and taste. For use sugar is added to it in quantity regulated by the taste of the consumer.

Although a wholesome and nutritious article of diet for adults, the absence of lactose renders it unsuitable for infant feeding. It is not a likely adulterant for cow's milk as its pronounced odour and taste would readily betray its presence.

Over 300 samples of aerated waters and ice-creams were examined for bacteria, the biological contamination in the majority being excessive.

2,800 lb. of phosphorus poison has been prepared for use in rat destruction. This preparation contains 1 in 80 of yellow phosphorus and is coloured a distinct blue to minimize risk. It is issued in the form of small cubes.

VACCINES.

The supply of glycerinated calf vaccine has been widely distributed in the Far East. 10,993 tubes were sent out from the Laboratory during the year —the equivalent of 54,965 persons protected against small-pox. The number of tubes of vaccine issued from the Laboratory in successive years since 1898 has been 5,000, 6,000, 22,500, 13,000, 12,000, 34,000, 28,500, 21,432, 15,958, 19,995, 16,879, 17,460, 10,044, and 10,993 respectively. The vaccine is sent out in tubes sufficing for five vaccinations, each tube bearing a label marked "Shanghai Municipal Laboratory," the date of issue from the Laboratory, and the number of the calf yielding the vaccine, so that any fault can be traced to the source. The vaccine is guaranteed to produce successful results for one month after the date marked on the tube if kept under suitable conditions. Vaccine is also sent out in bulk in rubber-corked tubes containing one or more grammes, in which form it is convenient for making a large number of consecutive vaccinations.

Those who have occasion to use small-pox vaccine during the warm weather should remember its great sensitiveness to even a moderately elevated temperature. It may be noted that vaccine at a temperature of 57° C. becomes inert in five minutes. Even at 37° C., a temperature often reached in summer in China, vaccine is rendered inert in twenty-four hours. On the other hand, at 5° C. below zero vaccine will remain unaltered for a year. Unless, therefore, there is some special reason, vaccination during the warm weather, say, between May 1 and September 30, is inadvisable in China owing to rapid loss of virulence at the prevailing atmospheric temperature. For this reason small-pox vaccine between these dates can not be guaranteed effective. The best time for vaccination undoubtedly is in the early winter months, that is to say, before small-pox becomes prevalent. The Chinese following their old custom of inoculation still hanker after spring vaccination.

Plague, typhoid and other bacterial vaccines have been sent out from the Laboratory. The demand for bacterial vaccines prepared according to the methods of Sir Almroth Wright is increasing.

ANTI-RABIC TREATMENT OF PASTEUR.

Since the opening of the Shanghai Pasteur Institute in 1899, 352 persons have received the treatment. During the past year twenty-five persons were treated, in eight of whom the animals responsible were proved rabid by inoculation. Ten of the cases were the result of dog bites within the Settle-

ment. None of these cases were known to develop hydrophobia subsequently.

Eighty-one dogs were admitted to the Observation Kennels, three of which proved rabid. Twenty-seven animals suspected of rabies were examined in the Laboratory and of these twenty-one were proved rabid by inoculation.

The incubation period of rabies in rabbits inoculated with the brain of dogs sent to the Laboratory for examination averaged fourteen days.

HOSPITALS.

Isolation Hospital.

Isolation for cases of infectious disease is provided at the Isolation Hospital, Range Road. There is a separate hospital for Chinese cases. Admission to either hospital is voluntary and the institutions are for the benefit not only of the patients admitted but of the community. Every endeavour is made to make the hospital as comfortable as possible and the surroundings pleasant, while the fees are arranged so that in no case may the question of payment of fees prevent anyone from coming into the hospital. The fees for admission to the foreign hospital are Tls. 6 a day for private rooms, and Tls. 2 a day for wards wherein free beds are available for poor people. Wherever possible the patients or their friends arrange for medical attendance. Admission to the Chinese Hospital is free, but a small charge is made for private rooms. In the Chinese Hospital patients may be attended by their own native doctors if they so desire. Considerable improvement is expected to result from the organization of the nursing of Chinese by Chinese under the supervision of the matron. It is gratifying to be able to report the increasing popularity of this hospital.

Ambulances are provided for the conveyance of patients suffering from infectious disease to the Isolation Hospital. Other vehicles used for conveyance of cases of infectious disease to the hospital are detained at the hospital until disinfected.

More accommodation is needed for cases among foreigners of minor infectious diseases, such as measles, chicken-pox, mumps, and erysipelas, and for observation of cases before diagnosis is confirmed. Isolated accommodation is also required for cases of tuberculosis among foreigners, for which there is at present no adequate provision in the Settlement. Were this provided on the Isolation Hospital site and worked in combination with a branch of the Municipal Sanatorium at Mokanshan, benefit would accrue both as regards the prevention and treatment of this disease. At present if a case of consumption occurs in a family which cannot afford to send the patient away to a proper European or American sanatorium, he often has to remain at home, becomes a source of infection to those with whom he comes in contact, and lives under conditions which render small the chance of cure. On the other hand, were there adequate accommodation for isolation and treatment it would then be possible to remove the patient to hospital, where the hygienic conditions would tend towards cure and a dangerous source of infection would be removed from the patient's own home. There is also need for dispensaries in different parts of the Settlement for the treatment and education in the means of prevention of Chinese cases of tuberculosis, for a hospital for advanced cases and for a sanatorium for treatment and isolation of curable cases.

Victoria Nursing Home.

The policy has been continued to make the Nursing Home as comfortable and efficient as possible in every particular. The kitchen and messing arrangements under a special resident foreign housekeeper have effected much improvement. The object aimed at is to have the food and service the best that can be obtained.

Mental Wards.

The mental wards appear to adequately fulfil their present function. Twenty-two cases were received during the year. Admission is procured by the signature on Form A or Form B, obtainable from the matron. Form A requires the signature of the person immediately responsible for patient, who undertakes responsibility for payment of fees, provision of medical attendance, for procuring any order that may be required by the law of the country to whom the patient belongs, and for removal of patient after six months if still remaining in the wards. Form B is used when no one immediately responsible is forthcoming, the responsibility then naturally devolving upon the Consul of the nationality of the patient. There still remain cases where a Consul will not assume responsibility and some sort of humane provision should be made for these cases to prevent them from becoming a nuisance or a danger both to the public and themselves, and at the same time to keep the mental wards from being filled with chronic lunatics, for which class of case they were never intended.

Police Hospitals.

Indian Police.—The health of the Indian Police has been well maintained. The average number of days off duty sick was 6·9 days per man as against 6·5, 8 and 7 days in the three preceding years. Tuberculosis of the lungs was again the chief cause of invaliding out of the service.

Chinese Police.—Seven men were invalided on account of tuberculosis, all except two living in their own homes. Fifteen cases of relapsing fever occurred among men living in their own homes. Twenty cases of benign tertian malaria were diagnosed by laboratory examination.

Chinese Prisoners.—Weekly inspections of the prisoners in cells at the various police stations have been made and cases of skin and venereal diseases, which are very common, sent for treatment to the Police and Isolation Hospitals; resulting in considerable improvement in the condition of prisoners admitted subsequently to the gaol. Nearly all the cases of relapsing fever were admitted to the cells

in the incubation period. The spread of the disease was prevented by thorough disinfection from body vermin, isolation of cases, and segregation for fourteen days of contacts. There was one case of benign tertian malaria, and one of the malignant type probably contracted in the Yangtse Valley.

Gaol.—Tuberculosis was again the main cause of death, most of the cases having signs of the disease on admission.

No new cases of beriberi occurred. From 1899 to 1901 the ordinary sanitary measures of isolation and disinfection were carefully carried out without success, no special measures against infestation with body vermin being taken. The new gaol, presumably vermin-free, was then occupied and at first no cases of beriberi occurred, in marked contrast to the severe infection in the old gaol. From 1904 till 1909 the cases of beriberi gradually increased, reaching a maximum in 1909 when the gaol was found infested throughout with bugs. During the last three years measures were taken to exterminate bugs which, though not entirely successful, are held responsible for the reduction in the number of cases of beriberi. The diet during the whole of this period was substantially the same. One block at the gaol is now being made vermin-proof, by making the walls smooth, replacing the wooden skirting boards by cement and by putting in cement ceilings below the wooden floors, so as to get rid of all cracks and crannies which might harbour vermin.

The new admission block provides facilities for the proper physical examination of prisoners on admission and secures the general mass of prisoners against infection from outside.

Sanatorium.

The Municipal Sanatorium was opened on May 15 and closed on November 23. The general consensus of opinion among the visitors was satisfactory as regards benefit to health and enjoyment, and confirmed the opinion held that Mokanshan is the best available place for a Municipal Sanatorium for Shanghai.

The railway to Hangchow has assisted in overcoming the difficulty in communication. Leaving Shanghai at noon Hangchow is reached at 5 p.m. the same day and the journey by creek from Hangchow to Sanjaopu at the foot of the mountain is conveniently made during the night. The ascent is made the following morning and the Sanatorium reached before tiffin time, that is to say, within twenty-four hours of leaving Shanghai. Returning visitors leave the Sanatorium at 3 p.m. and reach Shanghai at 1.30 p.m. the following day.

Owing to the prevalence of typhoons and white ants it is considered that a reinforced concrete building on a larger scale than the present house will, in the near future, be the best means of utilizing the undoubtedly fine site.

Sanitary Inspection.

By means of a system, inaugurated five years ago, of examinations in sanitary knowledge as applicable locally, divided into three stages each carrying extra pay, health inspectors, recruited locally, are being trained to a higher state of efficiency. In addition, monetary encouragement is given to obtain, while on long leave the certificates of the Royal Sanitary Institute and other examining bodies in touch with sanitary work. As a rule, our men find little difficulty in obtaining these home diplomas. The learning of Chinese by the foreign sanitary staff cannot but be a benefit in enabling them to instil the sanitary idea directly into the minds of Chinese residents.

Sub-district Offices.

The subsidiary Health Offices in each of the sixteen sub-districts into which the Settlement is divided for sanitary purposes have been further developed. Chinese houses have been rented and turned into fairly good local centres for sanitary work. Complete sets of books for record have been provided. Vaccinations are done weekly; public health notices are distributed; inquiries are answered; deaths and cases of infectious disease may be reported and lectures on sanitary matters are given weekly. The sub-district has been made the sanitary unit with its own complete staff and the sub-district office is a Health Office in miniature full of possibilities for the future.

Lectures.

A Chinese of the better-educated class is employed to lecture on health matters once weekly at each sub-district office. The subjects taken are those appropriate to the season, such as the notices dealing with vaccination and small-pox, plague prevention by rat-proofing houses and rat destruction, tuberculosis, cholera, mosquito reduction and general preventive measures. These lectures are calculated to remove ignorant prejudices and promote better feeling between the Chinese and the Health Office with a view to disease prevention. At many of the native schools the same lecturer gives short lessons to the pupils by arrangement with the schoolmaster, and is generally well received.

Chinese Dwellings.

The question of plague has an important bearing on the construction of Chinese dwellings. This was recognized at the time the Chinese Building Rules were first drawn out. It is held that a house which provides places where rats may obtain seclusion is insanitary on account of the special danger the Settlement runs from plague. The amendment of the Chinese Building Rules made two years ago has done some good. But the Building Rules as they stand are not a sufficient safeguard against plague, as was pointed out at the time and has since been shown by cases of plague occurring in new houses erected under these amended rules. In these particular houses, dead rats, undoubtedly the cause of the plague cases, were found in the hollow ceilings below the first floor. After a practical experience of rat-proofing over 8,000 Chinese houses it can be demonstrated that the ceilings below the

first floor are unnecessary and, being dangerous through the possibility of harbouring plague-infected rats, should be prohibited. A very large number of these ceilings have been removed without complaint of any kind. A considerable number of the upper ceilings have also been removed in districts badly infested with plague and the houses have been made quite comfortable; but in the case of the removal of upper ceilings some complaints have been received from the tenants, chiefly complaints of rain coming through the roof which, although primarily due to defective roofs, were made more noticeable by the absence of the ceiling, and complaints occasioned by the complete turning out of the tenants during these operations on the upper storey. The removal of the upper ceiling also adds very considerably to the expense of rat-proofing operations. Latterly, the removal of upper ceilings has not been carried out, as the danger from plague through rats in the upper ceilings is less than in the ceilings below the first floor in close proximity to the beds of the dwellers. For this reason and the comparatively greater expense of the work of removing upper ceilings it was considered a better plan to rat-proof a correspondingly greater number of houses by putting in solid ground floors and removing the ceiling below the first floor only. As a sanitary measure for the prevention of plague it is therefore again strongly recommended that ceilings below the first floor of Chinese houses should be prohibited. It should be remembered that ceilings in Chinese houses are a foreign innovation, and by no means a desirable one from a sanitary point of view.

Foreign Dwellings.

The attention of architects is called to the clause in the Public Health Notice headed "Kitchen," wherein it is suggested that every house should, if possible, have a serving-room adjoining the dining-room and separate from the kitchen. The serving-room should be fitted with a washing-up sink, Berkefeld filter, shelves for all the table utensils, groceries, &c., and room for the ice-chest. It is held that the separation of the serving-room from the kitchen is an important means of preventing those food infections which are so prevalent in Shanghai and which are brought into a house chiefly by infected vegetables. Cooking destroys the infective material, so that food that leaves the kitchen should reach the table without contamination. This can be ensured by having table utensils kept in, and the service of food done from a serving-room kept quite separate from the kitchen. The serving-room should be rather a part of the dining-room than of the kitchen. As an additional safeguard a place for the washing and preparation of vegetables prior to cooking may be provided in the yard outside the kitchen.

Many foreign houses are infested with rats and, should plague become prevalent, may become a source of great danger. In these houses the gratings under the ground floor are generally found loose or broken so that the interior of the house is easily accessible to rats, which then make use of all the hollow spaces which ceilings and lath and plaster partitions provide. It is advisable to have the ground floor as far as possible solid. The floor of the kitchen, larder, and outhouses should be solid and of cement if possible. Lath and plaster partitions are better avoided, but if used may be made fairly rat-proof by being made solid for about a foot from the floor, as rats generally obtain access by gnawing through near the floor level. The reinforced concrete method of construction is well suited to local conditions in view of the need for rat-proof buildings.

Observations extending over ten years on the natural disposal of organic matter in house refuse, with frequent inspection of the garbage heaps, tend to show that within a year and a half all the decomposable organic refuse disappears by oxidation, which is tantamount to slow combustion—the heat generated spontaneously in a garbage heap being very considerable—and leaves an innocuous mass, without smell, which forms a suitable material for filling in low-lying ground and shallow stagnant pools. It is not necessary to go so far as to recommend its use for raising building sites to be used within five years, but it would be excellent material for raising garden sites and for filling the holes left near houses by the excavation of mud if not below the ground water level. In the large garbage heaps at the depôt, the nuisance from smell and flies disappear after three months; and in properly conducted filling-in operations it is possible by covering recent house refuse with a layer of clean earth to remove nuisance from these causes and at the same time promote oxidation and destruction of the objectionable organic matter. In this way may be removed to some extent the further objectionable accumulation along the banks of the creek and the dumping of garbage into the waterways, which is difficult to entirely prevent. When it is remembered that every stagnant pool means mosquitoes, which are the potential cause of malaria, it is held that any temporary nuisance that may occur during the course of filling-in is outweighed by the sanitary advantages which subsequently accrue. This method, therefore, is advisable both from the point of view of economy and sanitation. Unfortunately distance prevents the use of this method for the refuse from the crowded districts of the centre of the Settlement unless some cheaper form of transport becomes available, *e.g.*, electric traction.

House Refuse Receptacles.

Primarily as a plague preventive measure, in order to limit the food supply of rats, 3,122 house refuse receptacles, rat- and fly-proof, have been erected during the last two years. After years of experiment, the form of receptacle now erected appears to fulfil its object best. The Chinese like them and mostly use them instead of throwing their garbage outside their doors; so that in all save the worst neighbourhoods a marked improvement in the cleanliness of alleys is found.

Colonial Medical Reports.—No. 60.—Shanghai (*continued*).

It is apparent that rats will thus be deprived of a vast store of nourishment and, as the rat population is to a large extent regulated by the amount of the available food supply, this is held to be a radical plague preventive measure. The approved form of receptacle is made of brick and cement or of cement concrete, is 3 ft. long by 2 ft. deep, with a sloping top, having a small iron slam door which cannot be opened beyond the vertical and so automatically shuts itself after house refuse has been emptied in; and having an iron door at the side with a special fastening of which the house refuse removal coolie only has the key and through which the refuse is daily removed.

Drainage and Paving.

It has been considered a duty in the ordinary course of sanitary inspection not only to point out sanitary defects but also, when requested, to provide the means whereby these defects can be best remedied and to supervise the work to completion.

The defect usually met with in the course of inspection is that of blocked surface drains, due to absence of proper surface inlets. The use of gully traps with hinged grids with lineal openings is desirable, instead of the small circular openings at present so frequently used. Although the standard of drainage is improved, much is still required before the materials used are laid so as to obtain maximum self-cleansing and ability to stand the test of hard wear and tear.

Creeks.

Regarding these important natural tide-flushed drains, the object has been the abolition of stagnant water and the maintenance of tidal channels open, clean and clear. The flatness of the Settlement necessitates the maintenance of certain waterways; and the Yangkingpang and Defence Creek, if properly maintained, are among them. The maintenance of the main artery creeks, so as to permit of daily tidal flushing, is a vital necessity. When a creek gets into such a condition that a daily tidal flushing is not obtainable, its conversion into a covered sewer is, if it is in a residential district, generally desirable; but the filling in or culverting of creeks that are accessible to all tides is seldom advisable from a sanitary point of view.

Mosquito Reduction.

A special staff was organized which worked from the beginning of April until the middle of October. The results are considered satisfactory, a diminution in the number of mosquitoes, estimated at from 25 per cent. to 75 per cent., having been effected.

Co-operation was obtained from most foreigners, but the majority of Chinese showed a complete indifference, amounting occasionally to active opposition. No prosecutions were undertaken to enforce these mosquito extermination measures, but this would appear desirable in flagrant cases after repeated warning.

A good class of coolie was obtained and heavy fines inflicted on finding mosquito larvæ in places recently worked through. The coolies worked in couples in an area exactly delimited. Each area was further subdivided into seven for each day in the week and a time-table kept so that it could be known exactly where each mosquito couple was working at any time. The Assistant Inspector accompanied and gave detailed instructions to each pair of coolies early in the season and made written notes of those unusual places where stagnant water was likely to be found, such as native gardens, empty houses, defective paving, gullies in unfrequented places, &c., *i.e.*, those places which were likely to be beyond a coolie's intelligence to think of or beyond his courage to enter; these places subsequently received the special attention of the Assistant Inspector. Practical roadside demonstrations were given of the way mosquitoes develop and how to prevent them developing by getting rid of all collections of stagnant water.

The thicker oils, containing a large proportion of crude petroleum, were not found to form good spreading films, even in the hottest weather—equal parts of kerosene and crude oil were found of most value.

Flies.

Against what has been truly described as "the deadly House-fly" the careful collection and disposal of house refuse is a measure of primary importance. Among other public measures has been the requirement as one of the conditions of licence, in premises licensed for the purpose of safeguarding the food supply, of adequate means being taken to prevent the access of flies to foodstuffs by the use of perforated zinc in windows and spring doors. This screening against flies is also an important individual measure and should be applied to the serving-room, kitchen, and servants' latrine; while cleanliness should be maintained in and about the house, so as to deprive the insect of food and of breeding-places.

FOOD.

As the preventible diseases specially prevalent in Shanghai are mostly caused by infected food, food inspection has been considered of paramount importance. The foreign food supply is under complete sanitary supervision and the same is gradually being done for the Chinese, premises being licensed as soon as the necessary conditions have been met.

Water Supply.

The periodical analyses of water supply by the Shanghai Waterworks Co. show that filtration is carefully done. Fifty-seven insanitary wells were abolished and a supply of waterworks' water furnished.

Milk Supply.

There has been a progressive improvement in the quality of milk supplied. The standard of cleanliness in dairies has been maintained. The windows of the milk-rooms are now required to be

unopenable and provided with perforated zinc instead of glass, and the door with a spring slam to prevent ingress of flies. The extreme step of withdrawal of the licence was taken in the case of Ah Kyi, Ching Kee, and Pau Kee Dairies during the year on account of ineradicable adulteration of milk after repeated prosecutions: all these dairies were in the Chapei district outside the Settlement. Efforts are being made to prevent the smuggling of milk from unlicensed dairies in Pootung. As regards the result of punishment inflicted at the Mixed Court for adulteration, it has been found, after observations extending over several years, that fining is the least effective, the offence being invariably repeated, while it tends to increase the price of milk to compensate for losses sustained. On the other hand, imprisonment and the cangue have a marked deterrent effect.

Fresh Food Shops.

The licensed butchers, poultry, game, and vegetable shops have been kept in good sanitary condition. Arrangements have been made for the licensing of bakeries, fruit, vegetable, fish, and other foodstuff shops, ice-houses, and aerated water factories.

8,305 lb. of unsound fruit, vegetables, &c., were seized and destroyed after confirmations by a magistrate and the Health Officer. The native ice-cream and cool-drink dealers have received the attention of the inspectors. When the danger of their wares was quite obvious they were confiscated and destroyed. The sale of cut melon has been discouraged. In every case where the sale of bad food was detected the vendors were given the option of prosecution at the Mixed Court or confiscation.

Meat Supply.

The examination of cattle and carcases at the Municipal Slaughter-house affords adequate protection of the meat supply. There was a substantial increase in the kill during the year.

Good meat is stamped with a circular stamp for beef and a triangular stamp for mutton, pork, and veal, with the words "Killed Municipal Slaughter-house," and the date of slaughter. Meat inferior in quality, but free from disease, passed for sale on stalls only, is marked "2nd quality." No meat for foreign consumption is allowed to be sold from any shop or brought into the Settlement unless it bears a Municipal stamp.

Such grease-shops as are within the Settlement are under constant inspection so that no nuisance or danger to public health is caused by them.

Colonial Medical Reports.—No. 61.—Seychelles.

MEDICAL REPORT, SEYCHELLES, FOR THE YEAR 1912.

By J. B. ADDISON.

Chief Medical Officer.

Vital Statistics.

Estimated Population.—The population of the Colony was at the end of 1912 estimated to be 23,507, made up of 11,983 males and 11,524 females, an increase of 402 on that of the year 1911, when it was estimated at 23,105.

Annexure shows the number of arrivals and departures from the Colony, the number of births and deaths during the year.

Birth-rate.—The birth-rate was 30·88 per 1,000, whereas in 1911 it was 31·94 per 1,000.

Death-rate.—The death-rate was 14·76 per 1,000, lower than 1911 when it was 15·79 per 1,000.

There were 118 deaths of children under 5 years of age, and of these thirty-four were under 1 year of age.

Meteorological Statistics.

Mean Temperature.—The mean temperature for the year was 80·2°, higher than that of 1911 which was recorded as 79·3°.

March was the hottest month of the year, the mean temperature for that month was 82·5°; July was the coolest month with a mean temperature of 78·1°.

Rainfall.—The total rainfall of the year was 105 in., higher than last year which amounted to 77·31 in. The year was a record: for the last eight years the rainfall did not exceed 90 in.

January, February and December were the wettest months, having a rainfall between them of 61·90 in. The month of August was the driest month, only 0·76 in. of rain fell in that month.

Winds.—The monsoon blew early this year from May and lasted until late in November.

Diseases Prevalent During the Year.

There was no outbreak of infectious or contagious disease during the year, the health of the population was good.

Beriberi.—Beriberi, which formerly caused considerable trouble in the outlying islands, seems to have practically disappeared. At St. Pierre Island,

Return of Diseases and Deaths in 1912 in the Victoria Hospital, Seychelles.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	2	—	2
Anæmia	7	—	9
Anthrax	—	—	—
Beriberi	4	—	5
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	3	—	3
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	25	2	28
Enteric Fever	—	—	—
Erysipelas	1	—	1
Febricula	10	—	10
Filariasis	—	—	—
Gonorrhœa	—	—	—
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	8	—	8
Kala-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	—	—	—
(b) Anæsthetic	—	—	—
(c) Mixed	—	—	—
Malarial Fever—	—	—	—
(a) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	14	5	15
Other Diseases	13	—	13
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	24	1	25
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	7	—	8
(a) Primary	—	—	—
(b) Secondary	—	—	—
(c) Tertiary	—	—	—
(d) Congenital	—	—	—
Tetanus	2	1	2
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(a) Phthisis Pulmonalis	7	—	8
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
General Diseases—*continued.*			
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	82	1	86
Circulatory System	15	5	18
(a) Valvular Disease of Heart	—	—	—
(b) Other Diseases	—	—	—
Digestive System—	—	—	—
(a) Diarrhœa	4	—	4
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	3	—	3
Congestion of Liver	—	—	—
(d) Abscess of Liver	7	1	7
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	1	—	1
(g) Cirrhosis of Liver	—	—	—
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	43	3	44
Ear	—	—	—
Eye	4	—	5
Generative System—	—	—	—
Male Organs	16	—	18
Female Organs	30	1	30
Lymphatic System	2	—	2
Mental Diseases	—	—	—
Nervous System	24	—	26
Nose	—	—	—
Organs of Locomotion	18	—	19
Respiratory System	31	2	32
Skin—	—	—	—
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	—	—	—
(d) Favus	—	—	—
(e) Eczema	5	—	8
(f) Other Diseases	4	—	4
Urinary System	18	—	19
Injuries, General, Local—	63	1	66
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	5	—	6
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	15	—	18
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

where there had been several severe outbreaks in former years, there were no cases. Bengal rice is still being used.

State of the Town of Victoria.

The sanitary condition of the town of Victoria is on the whole satisfactory, but there is considerable overcrowding in the central parts of the town inhabited by the Indian shopkeepers; there are more and more of these people coming to Mahé every year and they for the most part crowd into the already circumscribed area where they carry on their trade.

Water Supply.—The water supply is plentiful and good.

Scavengering, &c.—The cleaning of the streets and the night-soil service were satisfactorily carried out.

Reports of the Assistant Medical Officers.

Praslin Hospital.—The Assistant Medical Officer, Praslin, again points out the necessity of a small hospital on that Island. There is no doubt whatever that such an institution would be of the greatest value, not only to the people of Praslin, but also to those of the neighbouring small islands.

In cases requiring urgent operation, *e.g.*, strangulated hernia, many valuable hours are lost in conveying the patients to Mahé, it being quite impossible for the Assistant Medical Officer to operate on, and look after such cases in their own homes.

Millions.—The Assistant Medical Officer, South Mahé, states that he had had an opportunity of seeing the fish known commonly as *Millions* and that this fish is identical with the fish known locally as the Gudgeon; this is of considerable interest, I had understood that the two fish had many points of difference. The theory was put forward in Barbados some few years ago that it was the presence of great quantities of these *Millions* in the rivers which accounted for the non-existence of anophelines and malaria.

There is no doubt, however, that the local gudgeon do feed greedily on mosquito larvæ. I have tried the experiment of putting a few of these fish into a kerosine tin of water in which there were many larvæ, and with astonishing rapidity these have disappeared; furthermore, during the year a cement pond was made in the Government House grounds to be used as a lily-pond, a few days after the water was put in it was found teeming with larvæ, a few of the fish were introduced and the next morning no trace of larvæ could be found. I think people who have fountains in their gardens might be encouraged to introduce these fish into them.

An application was made during the year from the Health Department at Zanzibar for a supply of these fish; they were sent and arrived safely, but I have not heard if there has been any result.

Asthma.—The Assistant Medical Officer, South Mahé, puts forward a suggestion that the epidemics of asthma so common in the Colony may be due to a pollen or seed of some plant in the Colony. In my experience the epidemics of asthma walk hand in hand with the epidemics of common colds. I think the catarrhal condition of the air passages is the exciting cause of the asthmatical attack. I think that one in five of the population is overstating the prevalence of the malady, at any rate in adults.

Vaccination.

The results obtained from the lymph supplied by the Apothecaries Hall of London were most satisfactory. Four hundred and forty children were vaccinated in the Central District and all were successful the first time; such a good result has never been obtained before.

Quarantine.

The Quarantine Station at Long Island was constantly used, for the last half of the year the town of Mombasa was infected with small-pox and all vessels having touched at that port before coming to Mahé were placed in quarantine, and the passengers for this port were placed at Long Island for the full quarantine period.

Main House.—Great improvement was made in the accommodation for European passengers, an extra storey was added to the house, giving four good airy bedrooms with a fine verandah in front and a balcony on each side; the necessary furniture for these new rooms was provided.

Hospitals and Dispensaries.

In-patients.—The total number of in-patients treated in the Victoria Hospital was 553.

Out-patients.—2,419 persons received treatment in the Out-patient Department.

The female accommodation at the Hospital is insufficient and a private ward is badly needed. Provision is made to remedy this in 1913.

Maternity Home.—The Maternity Home was a signal success, the number of patients far surpassed what was anticipated, 156 patients were admitted to, and 135 babies were born in the Home.

The Home was full and overfull on several occasions; a house adjoining the Home was purchased during the year and will be used as nursing quarters, the present quarters being used as wards.

The institution seems to be thoroughly appreciated by women of all classes; this is undoubtedly in large measure due to the kindly and enlightened ministrations of the Matron.

New Midwives.—Two pupils were certified during the year and are both doing good work in the out districts.

Staff.—There were no changes in the staff during the year.

Dr. Bradley, the Assistant Medical Officer, South Mahé, was away on leave for four months. During his absence he was replaced by Dr. Power, Assistant Medical Officer, Victoria.

Nursing Staff.—The nursing staff at the Victoria Hospital carried out their duties with their usual diligence and devotion.

Colonial Medical Reports.—No. 61.—Seychelles (*continued*).

ANNEXURE.

	Males	Females	Total
Estimated population on December 31, 1911	11,768	11,337	23,105
Births during 1912	352	374	726
Arrival during 1912	140	43	183
Decrease by deaths	165	182	347
Decrease by departures	112	48	160
Estimated population on December 31, 1912	11,983	11,524	23,507
Net increase during 1912	215	187	402

Birth-rate during 1912 per thousand 30·88
Death-rate „ 1912 „ 14·76

RETURN OF PATIENTS TREATED AT THE DISPENSARIES.

Month	Victoria Hospital		Anse Royale		Anse Boileau		Praslin		Total
	M.	F.	M.	F.	M.	F.	M.	F.	M. and F.
January ...	38	92	8	12	1	2	8	12	174
February ...	32	133	5	14	1	1	15	6	207
March ...	43	155	9	18	—	2	8	9	244
April ...	42	104	11	9	1	—	9	8	184
May ...	42	103	17	21	1	—	8	6	193
June ...	45	130	14	10	—	4	4	6	213
July ...	47	123	26	21	—	2	10	17	246
August ...	28	71	9	36	—	1	17	8	170
September	43	124	13	23	—	5	6	6	220
October ...	37	110	21	37	—	10	14	12	241
November...	22	93	12	22	1	5	11	8	174
December...	33	77	15	14	—	1	10	3	153
Total ...	452	1,315	160	237	5	33	114	101	2,410

RESULT OF CASES TREATED AT THE VICTORIA HOSPITAL.

Sexes	Remaining in hospital at the end of 1911	Admitted during 1912	Total treated	Cured	Relieved	Unrelieved	Died	Remaining at the end of 1912	Total
Males ...	30	377	407	325	24	23	14	21	407
Females ...	6	140	146	107	19	10	9	1	146
Total ...	36	517	553	432	43	33	23	22	553

MEDICAL REPORT.

By Assistant Medical Officer, JOHN THOMAS BRADLEY.

SOUTH MAHE, 1912.

The health of the district was good, there were no diseases of an infectious or contagious nature noted during the year. Pulmonary tuberculosis caused four deaths during the year, and there were six deaths due to children dying soon after birth. Due to old age there were sixteen deaths, and the death-rate was 12·68 per 1,000.

General Diseases of the District.—Ankylostomiasis with its attendant anæmia is always common, especially with the poorer classes of white people that go barefooted. Tubercular disease holds ground, but it is not making the headway it did some years ago. Diseases such as gastritis, constipation, and colic, due to eating of food difficult to digest, are common, and diarrhœa and dysentery are always prevalent after heavy rains. With regard to diseases of the respiratory system, asthma is very common, in fact, 20 per cent. of the coloured and white population are subject to the disease; it is rare with the blacks. When the disease starts it seems to go about as an epidemic, and this has often raised a suspicion with me that it may be asthma due to a pollen or seed of some plant in the Colony.

Malarial Fever.—In my repart for 1911 I drew attention to the fact that anophelines were absent from the Colony, and I attributed this to the presence of innumerable little gudgeon in the rivers of the Colony. I had an opportunity while I was in London to see a fish called *Giravdinus Pœciloides* or *Millions*, and this little fish is identical in all respects with the little gudgeon found in our rivers.

VITAL STATISTICS.

There is a slight diminution in the death-rate, but from the past five years it has always kept at or about 12 per 1,000. The marriage rate is falling, and I consider this an important index with regard to the prosperity of the Colony; in prosperous years it goes up and in poor years it falls.

The principal diseases causing death during 1912 were: Senile decay, 16; infantile marasmus, 6; pulmonary tuberculosis, 4; tetanus, 3; gastro-enteritis, 3; anæmia, 3; diseases of the heart, 4.

The present Public Dispensary is now attached to the Lunatic Asylum, and by this fact all the medical departments are now grouped under the same roof.

LUNATIC ASYLUM.

During the year there was built a porter's lodge which also serves as a dispensary. By this means all the medical department of South Mahé is under the same roof, and the inconvenience of having the dispensary in the office of the Justice of the Peace is done away with. The Head Attendant of the Male Department acts as Clerk and Dispenser in the pharmacy.

The averge number of patients for the year was twenty; the daily cost per patient was about 50 cents, or Rs. 15, per month. We had as inmates an averge of three paying patients, who have contributed the sum of Rs. 802.50 towards their cost of maintenance. The inmates enjoyed good health during the year, there were no contagious or infectious diseases. Two males and two females died during the year.

Seven new patients were admitted during the year, five males and two females. There were discharged three males and one female as recovered, one male as relieved, and one male as not improved. There was no case of second admission during the year. Since the Asylum was opened in 1906 sixteen

persons have been discharged as recovered, two as relieved, and one as not improved. During that period the admittances were fifty-two and a recovery of sixteen patients works out a recovery rate of 30 per cent.

Various means are taken to keep the patients amused, there is a weekly dance, also a magic lantern performance once a week in the wards, the usual games such as dominoes, draughts, and cards. On weekdays there is a walk to places in the neighbourhood, and all means are taken to keep up their physical health and condition.

MEDICAL REPORT.

By Assistant Medical Officer N. P. Jewell, M.D.

Praslin District.

Praslin—Epidemics.—This, the main island, has been very healthy during the year, the death-rate being exceptionally low. There was a small outbreak of chicken-pox at Grand' Anse, which was confined to a single family, each member being affected in turn. All possible precautions were taken to prevent the disease from spreading, the family being confined to their own house and the surrounding courtyard until such time as the infective period was over. One case was reported from Anse Boudin and one from Anse Marie Louise, each being similarly quarantined to prevent the possible spread of the disease.

Dispensaries.—The Baie St. Anne Dispensary, as usual, was not much used, except for minor accidents to the cantonniers and for some chronic skin cases which were dressed regularly. The number of patients attending was seventy-eight, the male patients preponderating by sixty-eight to ten.

The Grand' Anse Dispensary was well attended, but mainly by chronic cases, such as anæmia, syphilis, and rheumatism. There was one case of fractured base of the skull—a boy who fell from a tree. He made a good recovery. The number of patients was 113—31 males and 82 females.

There was a very acute case of liver abscess, which again drew attention to the urgent necessity for a small hospital in Praslin. Venereal disease was, as usual, very common, especially gonorrhœa and its complications.

Vaccination.—The vaccine supplied during the year kept up its reputation and only failed in a few cases when it was rather stale. Ninety-one children were vaccinated, seventy-nine cases being successful the first time and eight on revaccination, while four still await revaccination, fresh vaccine not being available at the moment.

Vital Statistics.—During 1912 there were 94 births in Praslin, of which 8 were still-births, giving a birth-rate of 45·06, and there were 33 deaths, giving a death-rate of 15·81. Of these deaths 11 took place on Round Island, so that, excluding Round Island, the death-rate of Praslin for the year has been but 10·54 per 1,000, a very low figure for the Tropics.

The following short table shows the comparison of birth-rates, death-rates, and still-births for the years 1911-12:—

	1911	1912
Birth-rate	43·50 ...	45·06
Death-rate	17·80 ...	15·81
Still-births	6·0 ...	8·0

Round Island; Improvements.—This island has been the scene of many improvements during the past year. The road from the beach to the Pauper Camp has been completed and a new coast road to the Leper Camp begun. The boat shed has been made longer to accommodate the new pirogue, and a new kitchen has been made for the Overseer.

In the Leper Camp an attempt is being made to make the huts further apart and it is hoped that, during the present year, the hall where the male lepers formerly slept may be rebuilt for use as a recreation room in rainy weather.

Deaths, &c.—As usual many deaths have taken place in the Pauper Camp, but many of the younger inmates have been greatly relieved by treatment and some have gone away from the island and are now once more earning their own living. There was one death in the Leper Camp, that of an old African woman.

Complaints.—The camps have been kept clean and orderly throughout the year the only complaint being that there was no fish obtainable during many days in the south monsoon. However, a contract has recently been made for the local supply of fish to the island and up to date the scheme has worked well and there have been no further complaints.

"*Nastin.*"—In the Leper Camp the nastin treatment was continued during the year, but the good results obtained at the commencement of the treatment unfortunately have not been maintained except in one case, that of a fairly young man who acts as dresser in the camp.

In this case the drug has certainly done much good, and at present he has no open sores and feels greatly improved in health. In all the patients bacilli are to be found either in the nasal mucus or in the sores.

La Digue; Deaths.—During the past year the number of deaths on this island was much smaller than usual, being 23 as compared with 31 in the preceding year, in spite of increased population, while the number of deaths among children under a year old has fallen from 10 to 8.

Diseases.—The diseases most prevalent were, as usual, ankylostomiasis and venereal affections. The Dispensary, as in previous years, was poorly attended, the people of La Digue, on account of the richness of the soil, being mostly well-to-do. Only eight paupers attended during the year—seven males and one female.

The population of La Digue for last year, worked out on the same lines as that of Praslin, was 1,396.

Vital Statistics.—There were 42 births and 3 still-births during the year, and, as before mentioned, 23 deaths. This gives a birth-rate of 32·23 and a death-rate of 16·47 per thousand.

Fifty-six children were vaccinated during the

year. Of these fifty-five vaccinations were successful the first time and the fifty-sixth failed to return for examination.

Outlying Islands.—The outlying islands included in this district are Curieuse, Marianne, The Sisters, Cousin, Cousine, Aride, and some small uninhabited atolls. From a medical point of view there has been nothing of interest to report concerning them during the year, if we except a birth which took place in a pirogue between Marianne and Félicité Islands and three births on Curieuse. There was also one death on the latter island.

Colonial Medical Reports.—No. 62.—Nyasaland Protectorate.

REPORT ON SLEEPING SICKNESS.

By H. HEARSEY.

Principal Medical Officer.

DECEMBER 31, 1913.

NINETEEN additional cases of sleeping sickness have been notified during the past four months, namely, one from the Marimba district by Dr. Morgan, two from the Upper Shire district by Dr. Sanderson, and the remaining sixteen from the Proclaimed Area of the Dowa district by Dr. Conran.

Six of these cases were discovered in September, four each in October and November, and five in the month of December.

These nineteen cases, added to those previously reported, now make a total of 172.

Of this total the year 1913 has contributed 64 cases, as compared with 46 cases in 1912, and 38 in 1911.

The table which is annexed shows the distribution by districts of the cases notified in 1913, the period occupied in their investigation, and the number of cases found in each district:—

District	Duration of investigation	Number of cases found
Marimba ..	3 months	11
Dowa ..	12 ,,	49
Dedza ..	3 ,,	—
South Nyasa	2 ,,	2
Upper Shire	3 ,,	2
	Total ..	64

Of these 64 cases, 43 were males, and 21 females, or a proportion of about two males to one female.

The histories of the three cases which follow were omitted from the last memorandum.

Case No. 149.—Pelakamoyo, a male, of Chiboko village, situated about three miles to the south of the Bua river and four miles from the Lake shore, in the Marimba district. The patient is an old man of about 60 years of age, much wasted and exhibiting signs of prolonged illness. He has marked tremors of the limbs, closely resembling paralysis agitans, but there is no "pill-rolling." There are no enlarged lymphatic glands, nor other physical signs. In fresh coverslip preparations trypanosomes are seen, about one to a field, with the one-sixth objective. This patient had concealed himself from the medical officer and his patrols on several previous occasions. Chiboko village, also known as Mpondagaga, where a case (No. 118) had been previously found, is situated in the fringe of the tsetse-fly belt, but no fly could be discovered within half a mile of the patient's hut. The patient has since died.

Case No. 152.—Kamputhe, a girl of Nzwada village, on the Lipimbe river, Dowa district; diagnosed on August 31. The patient, a child of 3 years of age, has never left her village. On August 8 she complained of headache, and on the 18th of a cough. On September 1 she seemed dazed and would not reply to questions. When seen on September 4 she was lying on her mat in a semi-comatose condition; emaciation not marked; œdema of both feet and ankles; respirations shallow and rapid; slight sweating; pupils dilated; temperature 103° F.; pulse 120, almost imperceptible; glands enlarged in both the posterior triangles and epitrochlear regions; trypanosomes scanty. Patient died on September 30.

Case No. 153.—Kunyendula, an albino boy of about 10 years of age, of Mankwazi village, in the Marimba district. This patient had been seen several times between the months of May and October last year, and his blood examined on two occasions with negative results. He was then in fair general health, but suffering from scabies, for which he had received treatment. At the end of last August, however, when again seen, there was a marked change in his appearance. He was extremely emaciated and in a very neglected condition; his body was covered with itch and his fingers and toes attacked by chiggers. Trypanosomes were numerous in fresh coverslip preparations. The lymphatic glands all over his body were distinctly enlarged, but this may have been largely due to the presence of many small septic sores on his person. He had a very troublesome cough, with thick

nummular sputum; there were patches of tubercular breathing over both lungs, but no dulness on percussion. Mankwazi village is situated on rising ground, on the banks of the Nkumbeleza River, near the Lake shore. A large grassy plain extends for about a mile and a half between this village and the forested country where tsetse-flies are present in large numbers. The patient has since died.

September.

The following are the histories of the nineteen cases now under consideration.

Case No. 154.—Manchichi, a female, of Kamkwazi village, in the Marimba district. The case was diagnosed on September 19 and the patient died shortly after.

Case No. 155.—Maliro, a female, of Kabwabwa village, on the Katete river, Dowa district. Diagnosed on September 21. Patient, a woman aged 60, had been to Mtalamanja and back towards the end of July. Early in August she complained of headache, pain in the abdomen and diarrhœa. The abdominal symptoms improved, but the headache persisted, and by the beginning of September her feet and ankles became swollen. When seen on September 25 the patient was in an emaciated condition, and her gait was feeble and shuffling. Cerebration good, patient readily replying to questions. There was œdema of both feet and ankles. Skin dry, with a branny, desquamating rash over a great part of the trunk and extensor aspects of the limbs. Temperature, 99·2° F.; pulse, 116. One epitrochlear gland hard but small; glands in posterior triangles just palpable. Trypanosomes scanty in the blood. Patient died on December 1.

Case No. 156.—Jelemani, a male, of Chibungwe village, on the Lipimbe river, Dowa district. Diagnosed on September 29 from a blood film taken before death and delayed in transit. The patient died on September 21.

Case No. 157.—Kanyaula, a male, of Mtondo village, on the Chitala river, Dowa district. Diagnosed on September 29; died, unseen, on October 2.

Case No. 158.—Ammon, a youth about 18 years of age, of Kandambo village, Marimba district. He was first seen and diagnosed on September 28. The following history of the case was elicited: The patient was quite well until about a month prior to examination, when he complained of lassitude and headache and began to lose flesh. When seen he was much emaciated, though able to move about freely. Glands in the posterior triangles palpable, but no marked adenitis. Some slight œdema of the ankles. Pulse rapid, irregular, and of low tension. There was a well-marked mitral systolic murmur. Fresh blood preparations showed numerous trypanosomes. The patient had not left the vicinity of his village for many years; this village is situated on rising ground, on the southern bank of the Dwangwa river, about ten miles inland from the Lake shore. It is clear of bush and timber, but the forest in the immediate neighbourhood swarms with *G. morsitans*. Game is also very numerous.

Case No. 159.—Kunyamoto, a female, about 25 years of age, of Chipata village, Marimba district. She was first seen and diagnosed on September 29. On examination the patient was found to be not markedly emaciated; the glands in the posterior triangles were distinctly enlarged, but hard and firm; there was slight œdema of both ankles. Tachycardia was marked, the pulse rate being 130. There were tremors of hand and tongue. No history could be obtained of the patient having visited other parts of the country. Chipata village is situated on the Lake shore, about a mile and a half to the south of the mouth of the Dwangwa river. Tsetse-flies abound in the forest, about a mile inland.

October.

Case No. 160.—Msambachomwe, a girl, of Katawa village, on the Lilongwe river, Dowa district. Diagnosed on October 16. Patient is about 12 years of age, and had not left her village for many months. Towards the middle of August she complained of severe headache on the left side; this passed off after a time but returned early in September. Towards the end of September her feet and hands became swollen, and she developed a cough. By October 12 she was unable to walk and could only with difficulty be persuaded to drink. When seen on October 22 patient was a semi-conscious; emaciation not extreme; profuse sweating; pupils dilated; respiration laboured. Temperature 103·2° F.; pulse 140, thready. Glands not enlarged; no œdema. Trypanosomes present in the blood. Patient died on October 25.

Case No. 161.—Mperanjiru, a male, of Mankwazi village, on the Chitala river, Dowa district. Diagnosed on October 18. Patient, about 31 years of age, had not left his village for many months except for the purpose of hoeing his garden. Early in September he complained of headache which continued until death. When seen on October 30 patient was not emaciated; gait shuffling; cerebration slow; replies could only be elicited with difficulty. Speech slow and scanning; no rash; slight œdema of both feet; tremor of hands and tongue; signs of dilated heart. Temperature 103·6° F., pulse 120, of low tension. Trypanosomes numerous in the blood. Patient died on November 10.

Case No. 162.—Dongolosi, a boy, of Kampidu village, on the Lintipe river, Dowa district. Diagnosed on October 23. Patient, about 10 years of age has been in the habit of attending school at Sumaewa village on every week-day; this has necessitated a daily double journey through fly-infested bush. Towards the end of September he complained of persistent headache. When seen on October 28 patient was in an emaciated condition, with feeble gait and tremors of hands, head and tongue; nystagmus; no œdema. Temperature 103·5° F.; pulse 176, of low tension. Cerebration fairly good. One epitrochlear gland enlarged. Trypanosomes scanty in fresh blood preparations.

Colonial Medical Reports.—No. 62.—Nyasaland Protectorate (*continued*).

Case No. 163.—Adam, a male, of Naweta village, near Mpimbi, at the mouth of the Lifilesi River, in the Upper Shire district. The patient stated that he had travelled about a great deal, but that during the past twelve months he had remained at his village. His illness commenced with severe headaches, followed later by abdominal pain and persistent diarrhœa. On examination the patient was found to be fairly well nourished; the abdomen was considerably distended but not tender; there was no enlargement of liver or spleen. He stated that he had from four to six watery motions daily, accompanied by griping pain; he also complained of a dry cough. One cervical gland was found to be enlarged on the right side; the epitrochlear glands of both arms were enlarged, soft but firm. There was no œdema. Trypanosomes were scarce, only one seen in the fresh preparation and one in the smear, after an hour's search. There are extensive clearings round the patient's village, but *G. morsitans* was found in the immediate neighbourhood.

November.

Case No. 164.—Kalemba, a male, of Mlesi village, on the Lipimbi river, Dowa district. Diagnosed on November 1 and died two days later.

Case No. 165.—Msongo, a female, of Kampidu village, on the Lintipe river, Dowa district. Diagnosed on November 5 and died unseen on the following day.

Case No. 166.—Kwaweni, a male, of Kampidu village, as above. Diagnosed on November 20 and visited the same day. The patient is about 16 years of age; he had travelled to Mvera and back in August, since when he has been employed in cutting reeds for hut building. During the month of October he began to lose flesh and complained of weakness. On November 5 he went to Njesa village, near Ngani, on an errand, but was too ill to return. On November 9 he complained of severe occipital headache and pain in the back of the neck; his head was retracted. By November 17 he could no longer stand or speak, and refused all food. When seen on November 20 patient was unconscious; respiration laboured; abdomen retracted; eyes open and pupils contracted. There was no œdema; the epitrochlear glands were enlarged. Temperature 99·5° F.; pulse 130. Trypanosomes present in blood. Patient died on November 23.

Case No. 167.—Jamu, a male, of Fundichiliwa village, near Domira Bay, Dowa district. Diagnosed on November 26. The patient is about 30 years of age, and had travelled to Mambo and back early in September. In the early part of October he complained of headache and felt weak and unable to work. At the end of the month his feet became swollen and painful. When seen patient was in an emaciated condition, his gait was shuffling and slow, and there were tremors of hand and tongue. Temperature 100·2° F.; pulse 120. There were a few palpable glands in the posterior triangles; both the epitrochlears were enlarged. Trypanosomes present in the blood. Patient died on December 30.

December.

Case No. 168.—Damba, a male, of Msosa village, on the Lake shore, Dowa district. Diagnosed on December 10 from a fresh blood preparation. Patient is about 50 years of age and had been working his garden at Mkokawambo since the beginning of November. On the 12th of that month he complained of headache and pain in the back; after about ten days the headache improved but he felt weak and ill. When seen he presented a fairly well nourished appearance; gait fair, slight tremor of glands and œdema of feet. One epitrochlear gland was enlarged. Temperature 102·5° F.; pulse 124. Trypanosomes present in blood.

Case No. 169.—Gundura, a male, of Muyanja village, on the Lipimbe river, Dowa district. Diagnosed from a blood slide on December 11; died unseen on the same day.

Case No. 170.—Mchele, a male, of Galanje village, in the Upper Shire district. The patient is about 55 years of age and has been ill for about two months with fever and cough and pain in the chest. He is emaciated and bedridden; there is slight œdema of legs and feet; the glands in the epitrochlear and cervical regions are small, hard and shotty. He has chronic bronchitis, with attendant emphysema. Trypanosomes very scanty, autoagglutination marked. The patient had visited the Dedza district in August and stated he had been much bitten by flies near Malembo; infection, however, was probably contracted in South Nyasa district.

Case No. 171.—Timon, a male, of Chimonjo village, on the Lipimbi river, near Mtalamanja, Dowa district. Diagnosed on December 31.

Case No. 172.—Mwaranji, a male, of Tasa village, two miles to the north-east of Waya, near the Kuti dambo, Dowa district. Diagnosed on December 31.

Prophylaxis.

The preventive measures which have been instituted in the Proclaimed Area of the Dowa district are reported to be attended with satisfactory results.

The importance of avoiding being bitten by tsetse-flies is being instilled in the minds of the inhabitants, and it is hoped that in time the natives will be as fully convinced of the association of tsetse-fly with trypanosomiasis as they are of ticks (*O. moubata*) with spirochæte fever.

Clearing operations are progressing satisfactorily, but as this is being done by voluntary labour it is only to be expected that the results will vary with the amount of time and energy which individual communities are disposed to devote to this work. Dr. Conran, however, reports that a quite perceptible diminution in the number of flies from the immediate neighbourhood of villages has resulted from these clearings.

The village latrine system which has been instituted with a view to preventing natives from visiting the "bush" for the purpose of defæcation is not working as satisfactorily as was anticipated; but with the application of a little pressure it is hoped that better results will follow.

Prohibition in regard to the visiting of neighbouring fly-infested forests for timber needed for hut building can, from the nature of the case, only be partially effective; but every effort is being made to induce natives to rely on the timber which has already been felled in the course of clearing operations for their supplies of firewood for domestic purposes.

Removal of villages has not been insisted on as a compulsory measure, as it is felt that better results will be obtained by persuasion, and that scattered communities living in danger zones will themselves realize that sickness and mortality are best avoided by removal to more favourable situations. In the case of Kampidu, a village which during the year 1913 has yielded the largest number of infected cases, the headman was easily persuaded to move his people to a better site.

Investigation of Districts to the North and South of the Proclaimed Area.

It will be noted that the investigation of these districts has yielded results which point to the Marimba district being infected to an approximately equal extent with the Proclaimed Area in the Dowa district, eleven cases of sleeping sickness having been found during a period of three months investigation of this district.

On the other hand, the districts to the south of the Proclaimed Area, namely, Dedza, South Nyasa, and Upper Shire, have furnished an aggregate of but four cases; and it may therefore not unreasonably be inferred that they harbour comparatively few infected natives.

Any explanations which may be advanced to account for the disparity in the results which have been obtained in the north of the Proclaimed Area, and in the districts to the south of it, must to a large extent be speculative, seeing that the fly areas in all these districts coalesce, and that a member of the Scientific Commission of the Royal Society has demonstrated that the game as far south as the Upper Shire district is infected with *T. rhodesiense*.

Colonial Medical Reports.—No. 63.—Fiji.

ANNUAL MEDICAL REPORT, 1912.

By G. W. A. LYNCH.

Chief Medical Officer.

The estimated population of the Colony at the end of 1912 amounted to:—

Race	Totals	Totals at last decennial census (1911)
Europeans	4,113	3,707
Half-castes	2,496	2,401
Indians	48,614	40,286
Polynesians	2,769	2,758
Rotumans	2,087	2,716
Fijians	87,833	87,096
Chinese	397	305
Others	958	812
Total	147,180	137,365

The total population at the end of the year 1911 (the census return for April of that year) was, omitting Rotuma, 140,796; there is, therefore, a total increase in population for twelve months of 6,384. The increase is in all races of the population of the Colony except Polynesians, who have decreased by 222, leaving the net increase as stated. The Polynesian decrease is due to the facts that Polynesians are no longer brought to the Colony, and that during the year a somewhat larger number than usual returned to their homes.

The Indian increase is again due, for the most part, to the larger number of immigrants who arrived, against the comparatively small number repatriated; of the former, there were during the year 3,004; of the latter there were 719. The figures tabulated are as under:—

Race	Increase	Decrease
Europeans	379	—
Half-castes	66	—
Indians	5,312	—
Polynesians	—	222
Fijians	604	—
Chinese	92	—
Others	153	—
Total	6,606	222

Particulars of births, deaths, and marriages in 1912 are shown in the table below:—

Races and Nationalities	Births	Deaths	Marriages
Europeans	96	43	38
Half-castes	83	17	28
Indians	1,732	783	616
Polynesians	14	17	28
Fijians	3,356	2,752	552
Chinese	—	—	—
Others	10	5	—
Total	5,291	3,617	1,254

The total number of births shows a considerable increase over the figures of 1911, and a small increase over those of 1910. For comparison, the figures of 1911 and 1912 are as follows:—

BIRTHS.

Race	1911	1912	Increase	Decrease
Europeans ..	90	96	6	—
Half-castes ..	70	83	13	—
Indians ..	1,271	1,732	461	—
Polynesians	21	14	—	7
Fijians ..	3,298	3,356	58	--
Chinese and others ..	12	10	—	2
Total ..	4,762	5,291	538	9

A net increase of 529 births, where it is satisfactory to note an increase of 58 births of Fijians over the former years, though there is a decrease as compared with 1910, in which year the births of Fijians were 3,377. The difference of the Indian figures between 1911 and 1912 makes it appear likely that there were lacunæ in the returns for the former year. Indian births in 1910 were 1,465.

The figures for marriages show an all-round decrease as compared with 1911, being 1,254 for 1912, against 1,693 for 1911.

The number of deaths show a decrease for all races:—

DEATHS.

Race	1911	1912	Decrease
Europeans ..	46	43	3
Half-castes ..	24	17	7
Indians ..	791	783	8
Polynesians ..	25	17	8
Fijians ..	3,351	2,752	599
Chinese and others ..	12	5	7
Total ..	4,249	3,617	632

A net decrease in the total of deaths for the whole Colony of 632 persons. In 1910 the total number of deaths in the Colony, excluding Rotumans, were 4,799.

The general birth-rate for the Colony in 1912 was 35·94 per mille, against 33·20 per mille in 1911, 37·12 per mille in 1910, 38·19 per mille in 1909. The European rate was 23·3, against 24·10 in 1911, and 26·16 in 1910. The birth-rate for Fijians was 38·20 per mille, against 37·80 in 1911, and 38·61 in 1910. The rate for Indians was 35·60 per mille, against 29·35 per mille in 1911, and 37·28 per mille in 1910. As noted before, the low figures for 1911 are probably due to failures to register. Tabulated, the figures show as follows:—

Race	1910. Per mille	1911. Per mille	1912. Per mille
Europeans ..	26·16	24·10	23 34
Fijians ..	38·61	37·80	38·20
Indians ..	37·28	29·35	35·60
All races ..	37·12	33·20	35·94

The death-rate for 1912 for all races in the Colony was 24·58 per mille, a striking reduction from the figures of former years—33·11 in 1911, 35·44 in 1910, 29·31 in 1909, and 31·38 in 1908. The European death-rate was 10·45 per mille, against 12·34 per mille in 1911, and 19·10 per mille in 1910; the Fijian rate was 31·33 per mille, against 37·69 per mille in 1911, and 41·24 per mille in 1910; the Indian rate was 16·53 per mille, against 18·24 in 1911, and 25·91 per mille in 1910. Tabulated, the rates for the three years appear as follows:—

Race	1910. Per mille	1911. Per mille	1912. Per mille
Europeans ..	19·10	12·34	10·45
Fijians ..	42·24	37·69	31·33
Indians ..	25·91	18·24	16·53
All races ..	35·44	30·10	24·58

The general rate for all races is low for a tropical country, and that in spite of much dysentery in the early part of the year. The general fall in all death-rates is encouraging and very especially so the marked diminution in the Fijian death-rate. Attention must be called to the fact, in relation to the European rate, that many Europeans retire from the Colony and do not spend their last years here, and also that some European invalids, who might, if they remained, die, leave the Colony for more temperate climates. In spite of discounting the rate by these two facts, it remains a low one for a tropical country.

Returns are appended showing the number of admissions, diseases, and deaths at the Colonial Hospital, Suva, the provincial hospitals for natives, and to the plantation hospitals for indentured labourers. Admissions to provincial hospitals were 3,917 with 79 deaths; 14,861 out-patients were treated. Admissions to plantation hospitals were 13,329 with 302 deaths; there were few out-patients at plantation hospitals, the patients being in all cases admitted if they are unfit to go to work. The native medical practitioners treated in all 35,768 cases, with 160 deaths. There is a considerable reduction in the number of admissions both to provincial and plantation hospitals, as compared with last year.

DISEASES.

Dysentery.—The number of cases of dysentery treated throughout the Colony in 1912 was large, and, on the whole, was serious, as in the two or three years previously at the Colonial Hospital 419 cases were treated with 37 deaths, against 274 cases in 1911 with 15 deaths, and 353 cases in 1910 with 12 deaths. In the provincial hospitals 177 cases with 16 deaths, against 220 cases and 20 deaths in 1911, and 347 cases and 54 deaths in 1910. In plantation hospitals 686 cases with 46 deaths, against in 1911, 1,019 cases and 40 deaths, 1,136 cases and 84 deaths in 1910; while native medical practitioners treated in 1912, 581 cases with 21 deaths, against 621 cases and 33 deaths in 1911.

PERCENTAGE OF DYSENTERY CASES TO TOTAL ADMISSIONS.

Hospital	1910. Per cent.	1911. Per cent.	1912. Per cent.
Colonial Hospital ..	18 25	12·60	24·24
Provincial Hospitals ..	6·13	3·77	4·50
Plantation Hospitals ..	6·77	6·21	5·03
N.M.P. Cases ..	—	—	1·82
Total ..	7·50	6·26	3·62

MORTALITY RATE OF DYSENTERY.

Hospital	1910. Per cent.	1911. Per cent.	1912. Per cent.
Colonial Hospital ..	3·39	5·47	8·82
Provincial Hospitals ..	15·56	9·09	9·03
Plantation Hospitals ..	7·25	4·80	6·70
N.M.P. Cases ..	—	—	3·61
Total ..	8·08	5·55	6·44

Return of Diseases and Deaths in 1912 in the Colonial Hospital, Fiji.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	12	—	13
Anæmia	—	—	—
Anthrax	—	—	—
Beriberi	1	—	1
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	17	—	17
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	1	6	29
Delirium Tremens	—	—	—
Dengue	43	—	44
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	413	37	417
Enteric Fever	12	—	12
Erysipelas	1	—	1
Febricula	—	—	—
Filariasis	22	—	23
Gonorrhœa	23	—	25
Gout	1	—	1
Hydrophobia	—	—	—
Influenza	1	—	1
Kala-Azar	—	—	—
Leprosy	26	—	27
(a) Nodular	—	—	—
(b) Anæsthetic	—	—	—
(c) Mixed	—	—	—
Malarial Fever—	133	3	140
(a) Intermittent	5	—	5
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	9	—	9
Mumps	13	—	13
New Growths—	—	—	—
Non-malignant	5	—	5
Malignant	4	2	4
Old Age	—	—	—
Other Diseases	66	5	79
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	1	—	1
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	12	5	13
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	1	1	1
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(a) Primary	6	—	6
(b) Secondary	21	1	21
(c) Tertiary	23	4	24
(d) Congenital	—	—	—
Tetanus	4	1	4
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(a) Phthisis Pulmonalis	45	10	49
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

	Admissions	Deaths	Total Cases Treated
General Diseases—continued.			
(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	7	—	10
Other Tubercular Diseases	9	7	9
Varicella	—	—	—
Whooping-cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	72	1	75
Circulatory System	—	—	—
(a) Valvular Disease of Heart	2	1	2
(b) Other Diseases	7	4	7
Digestive System—	—	—	—
(a) Diarrhœa	26	—	26
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(d) Abscess of Liver	2	—	2
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	2	—	2
(g) Cirrhosis of Liver	1	—	1
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	67	4	68
Ear	2	—	4
Eye	40	—	41
Generative System—	—	—	—
Male Organs	29	—	29
Female Organs	60	1	63
Lymphatic System	11	—	11
Mental Diseases	2	1	2
Nervous System	21	1	22
Nose	—	—	—
Organs of Locomotion	11	—	13
Respiratory System	77	6	83
Skin—	—	—	—
(a) Scabies	15	—	15
(b) Ringworm	—	—	—
(c) Tinea Imbricata	3	—	3
(d) Favus	—	—	—
(e) Eczema	3	—	3
(f) Other Diseases	13	—	13
Urinary System	10	2	11
Injuries, General, Local—	97	2	104
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	109	10	113
Filaria medinensis (Guinea-worm)	3	—	3
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	5	—	5
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

[For Contents see page vii.]

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